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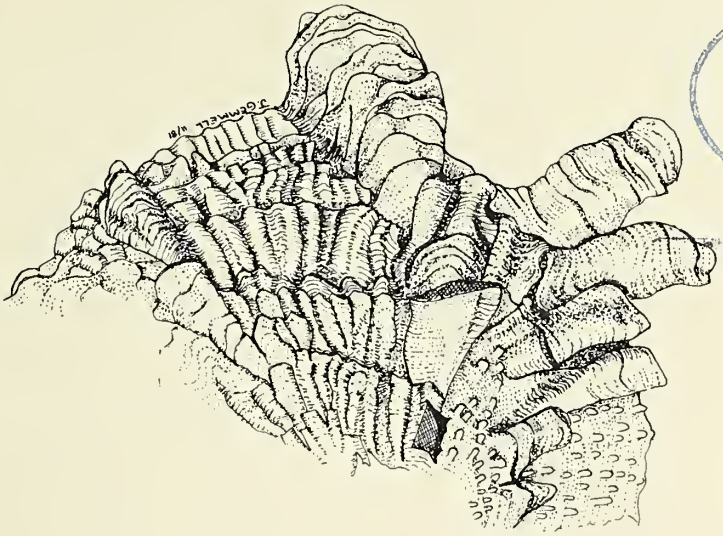

A Faunal Study of the Bivalves of San Felipe and Environs, Gulf of California, from the Gemmell Collection (1965 to 1976)

by

Joyce Gemmell, Barbara W. Myers and Carole M. Hertz

Chama buddiana
C.B. Adams, 1852
interior of left valve

Cover illustration: right valve exterior and left valve ventral area of specimen shown above

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A FAUNAL STUDY OF THE BIVALVES OF SAN FELIPE AND ENVIRONS, GULF OF CALIFORNIA, FROM THE GEMMELL COLLECTION (1965 TO 1976)

BY

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ABSTRACT

The 172 species of bivalve mollusks from the Gemmell collection of the Bahía San Felipe area (including Puertecitos and San Luis Gonzaga) in the northern Gulf of California are studied. Twenty-three of these species have not previously been reported from the San Felipe area. Nine additional species were first recorded by the authors in earlier papers.

Background information on the area, with descriptions of collecting sites and profile maps, is provided. The annotated catalogue includes original references, notes on the differences between species, distribution records, ecological information, species illustrations (often of type material), and modified synonymies.

HISTORY AND EARLY DAYS OF SAN FELIPE

San Felipe [31°3'N; 114°50'W], originally a fishing camp and now a resort on the western side of the northern Gulf of California, is 60 miles south of the mouth of the Colorado River and is within the Sonoran Desert. It was not visited by Europeans until the 18th century. In the 1500s, Jesuits Francisco de Ulloa (1539) and Hernando Alarcon (1541) had explored the northern Gulf as far as the "Red River," and the Jesuit Fathers Kino and Salvatierra, between 1685 and 1706, had also traveled the Gulf to the mouth of the Colorado. In fact, Father Kino collected shells in the northern Gulf and on the west coast of Mexico, confirming that Lower California, which had been considered an island on all contemporary maps, was connected to the mainland (Baily, 1935). However, to our knowledge, no mention is made of these explorers having stopped at what is now San Felipe.

In 1721, Padre Pedro Ugarte sailed his sloop, Triunfo de la Cruz [Triumph of the Cross] to the northern Gulf and "first made known and named" the islands, bays, and ports which included the area of San Felipe (Taylor in Browne 1869:11) but we have seen no record of these names. Jesuit Padre Fernando Consag, in his expedition in 1746, is credited with discovering and naming "the bay and water hole...San Phelipe de IHS" (North, 1908:37; Lewis and Ebeling, 1971) (Figure 1). Taylor in Browne (1869:11) states that San Felipe was established in 1858 and "has a fine little harbor, and has been used by American vessels bound for the Colorado...."

Evidence of early Indian camps in San Felipe has been noted by Schenck and Gifford (1952) who observed kitchen middens containing mollusks shells, small manos, and fragments of what appeared to be metates "but no projectile points were observed." Gemmell found obsidian points as well as *Olivella* beads in some midden sites. Meigs (1939:27) wrote that historically the Kiliwa Indians used San Felipe as a fishing camp during the wet winter months, gathering clams and mussels and catching fish for drying in the sun. "By summer, it was said, the fresh water in San Felipe was so dried up that no one lived there permanently."
Coan (1965) discussed midden material along the entire west end of Bahía San Luis Gonzaga and listed the various molluscan species used as food by the Indians. These reports did not indicate the dates of Indian residence in these areas.

Edward W. Nelson (1921) in his survey expedition for the U.S. Department

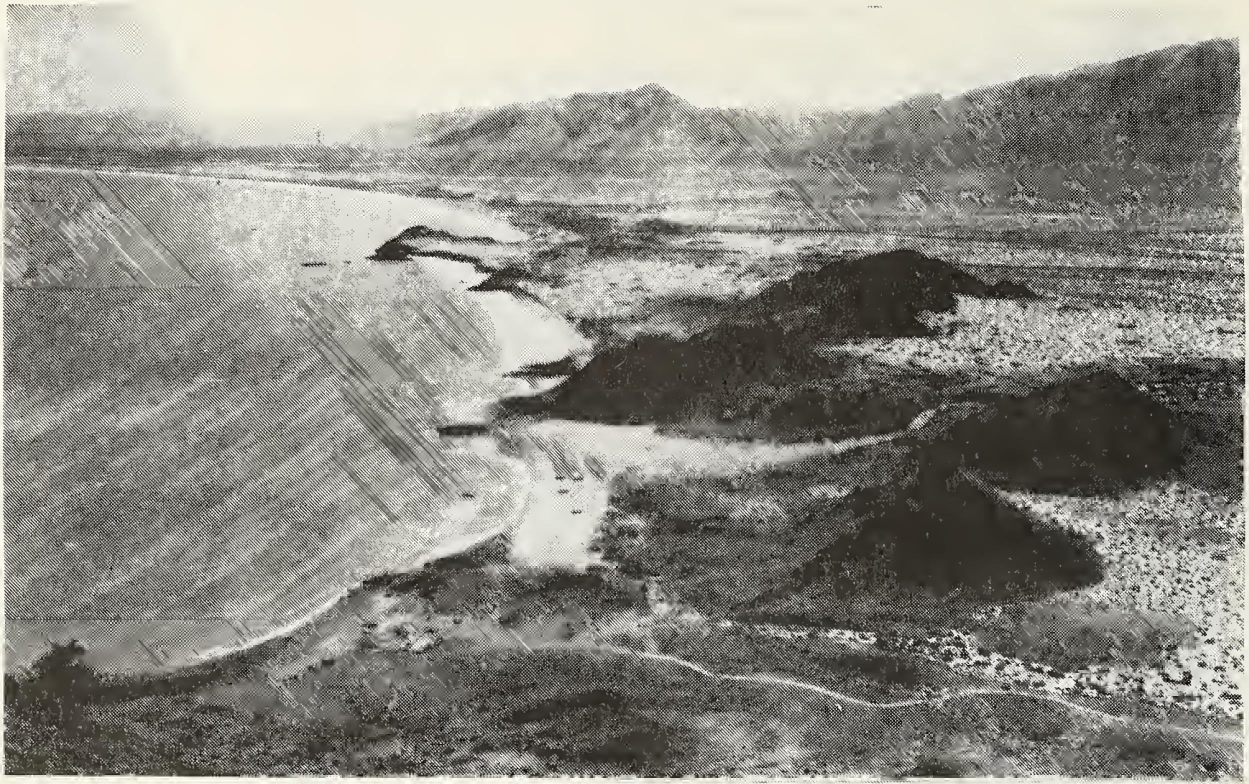


Figure 1. San Felipe Bay, March-April 1926. "Looking from the summit of the promontory at the north end of the bay. The Japanese camp shows in the foreground." Photo and legend by L.M. Huey. SDNHM photo archives #1221.

of Agriculture (1905-1906) traversed the Baja Peninsula eight times from coast to coast. In June 1905 he arrived in the San Felipe Bay area and in his account (pp. 17-19) he includes comments on the heat, trail conditions, tides, foul water, the overall topography, and the plants and animals of the area.

In 1911 there was still only one wagon road to San Felipe from Ensenada which branched in the interior and also went to Calexico (Nelson, 1911:445). Huey, in his 1926 unpublished diary, mentions that the road after a half-hour run, "was submerged in places and made travel very difficult for the cars slid about as though the road had been greased with great flakes of wet mud half an inch thick flying in all directions " (Figures 2 and 3).

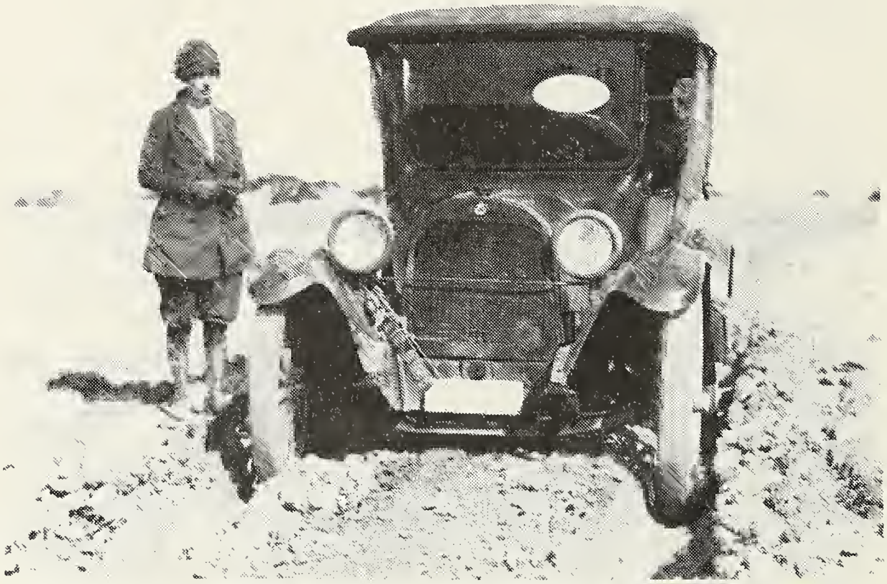


Figure 2. "Road through the delta en route to San Felipe. Mrs. Vandruff beside a Dodge touring car taking supplies to San Felipe." March-April 1926. Photo and legend by L.M. Huey. SDNHM photo archives #1144.

He noted that in San Felipe there were only crude fishing shacks and made no mention of a permanent settlement. Huey (1953:9) claimed that as late as the early 1900s San Felipe "was only a watering place" and that drinkable water could be obtained by digging a few feet below the surface near the beach (Figure 4). Schenck and Gifford (1952) also theorized that with no potable water in San Felipe, the early Indians must have dug wells to support their population.

Herbert N. Lowe, in 1933, was the first conchologist to visit and write about San Felipe, though the San Diego Natural History Museum and the University of California both had temporary camps in San Felipe as early as 1926. Lowe described the part of the road to San Felipe as Colorado River silt, (Figure 5) easily traveled in the dry season "but utterly impossible in the wet season when the high water from the Gulf overflows the whole country." He noted that San Felipe was "an assortment of Yaqui Indian fishermen's shacks made from ocotillo stalks and placed in the sand for sides, roofs constructed of discarded gasoline tins and pasteboard cartons." On this trip he considered that he "returned with a good representative collection of the mollusks of the region." As a result of that trip, Lowe (1935) described seven new species from San Felipe.

Other expeditions which visited the San Felipe area and collected mollusks were the Velero III Expedition (Fraser, 1943) and the Puritan American Museum of Natural History Expedition to Western Mexico, Gonzaga Bay, in 1957 (Emerson, 1958).

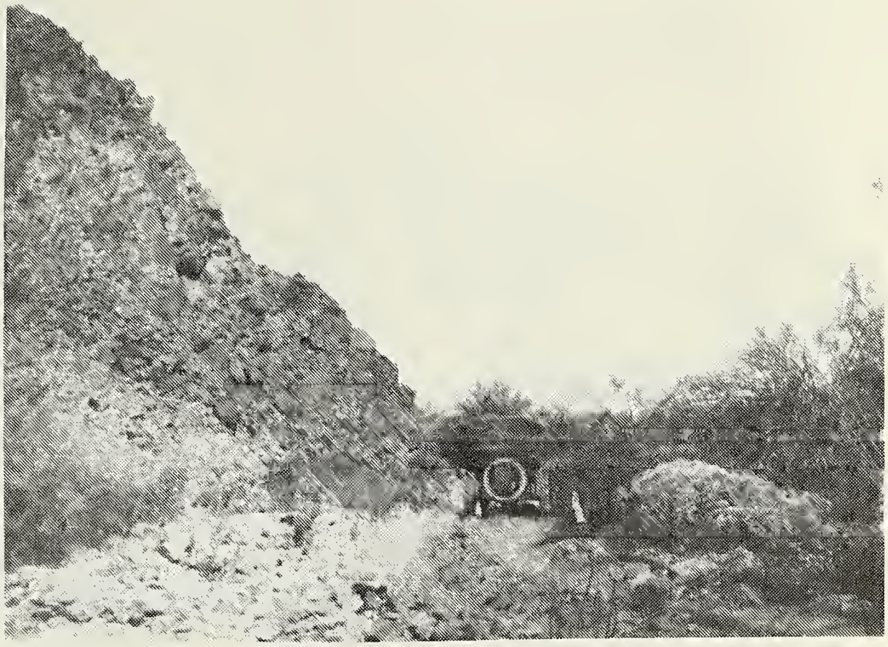


Figure 3. "A rocky bit of the road. Traveling north from San Felipe." March-April 1926. Photo and legend by L.M. Huey, SDNHM photo archives #1111

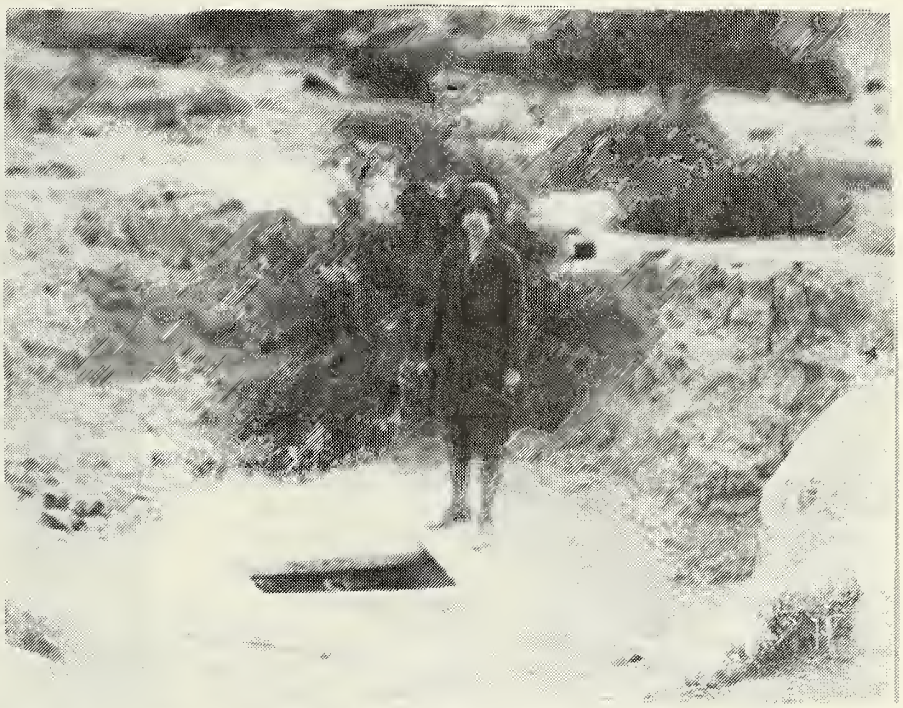


Figure 4. Mrs. Vandruff at the San Felipe waterhole. March-April 1926. Photo and legend by L.M. Huey. SDNHM photo archives #1151

SAN FELIPE IN RECENT YEARS

Until the completion of the 125-mile paved road to San Felipe in 1951 (Sunset, Nov. 1985), there were few published reports of collecting there. Then Faye Howard,

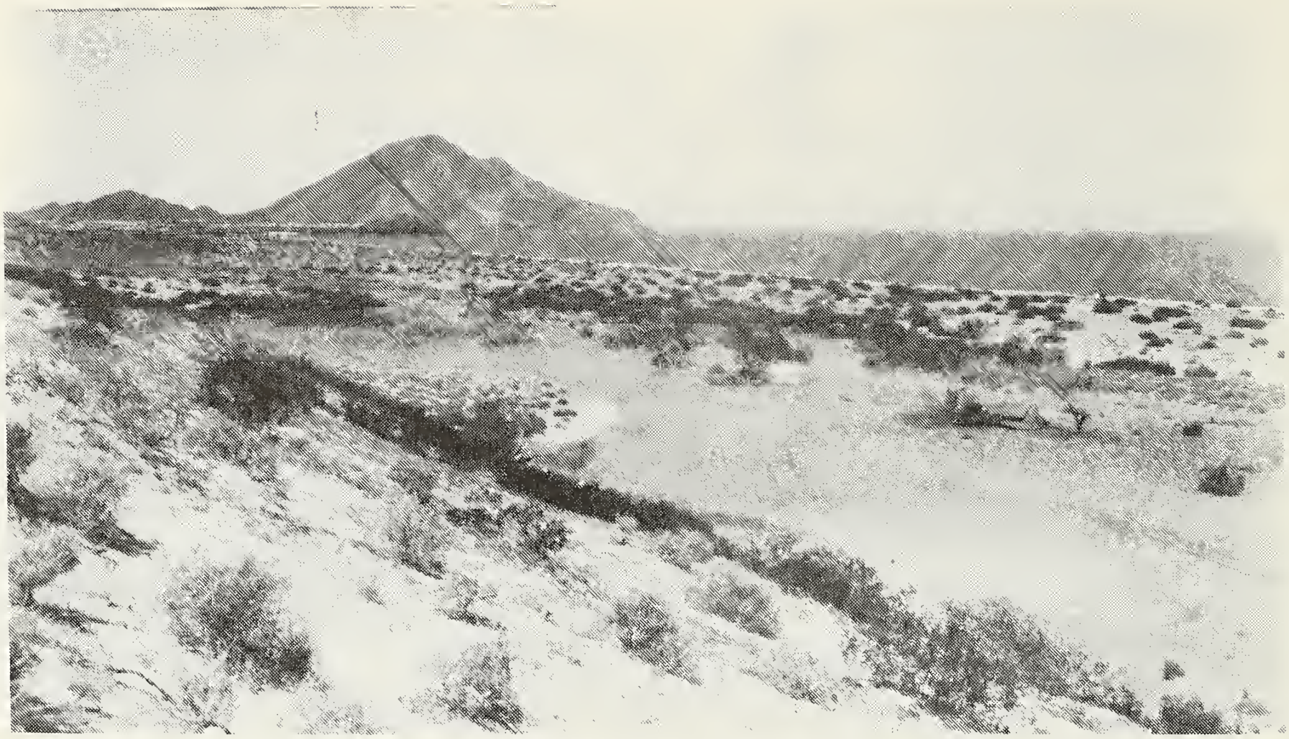


Figure 5. Bahía San Felipe looking north, March-April 1926. "In the foreground is the camp of the University of California, while the camp of the San Diego Society of Natural History is in the center, with San Felipe Bay beyond." Photo and legend by L.M. Huey. SDNHM photo archives #1229

wrote and described in detail and with humor her experiences collecting and traveling around San Felipe (Howard, 1986). Helen DuShane's checklist of mollusks for Puertecitos, (DuShane, 1962) was the first for the northwestern Gulf; Lowe (1935) already having published a checklist for the northeastern Gulf at Punta Peñasco. The News of the Associated Shell Clubs of California, which ceased publication in 1969, has many enjoyable articles on collecting trips to the San Felipe area by individuals and groups.

Joyce and her husband, Bill Gemmell, began visiting San Felipe in 1963 and settled there in the trailer park, Club de Pesca, in 1964. Bill became a fisherman and Joyce started to collect shells. (She already had a Florida shell collection from visits to that area.) It was on a trip to Guaymas, Sonora, in 1963 that Joyce met Mary Ricaud, a shell shop owner knowledgeable about Gulf shells, who advised Joyce to buy Keen's 1958a Sea Shells of Tropical West America (Figure 6).

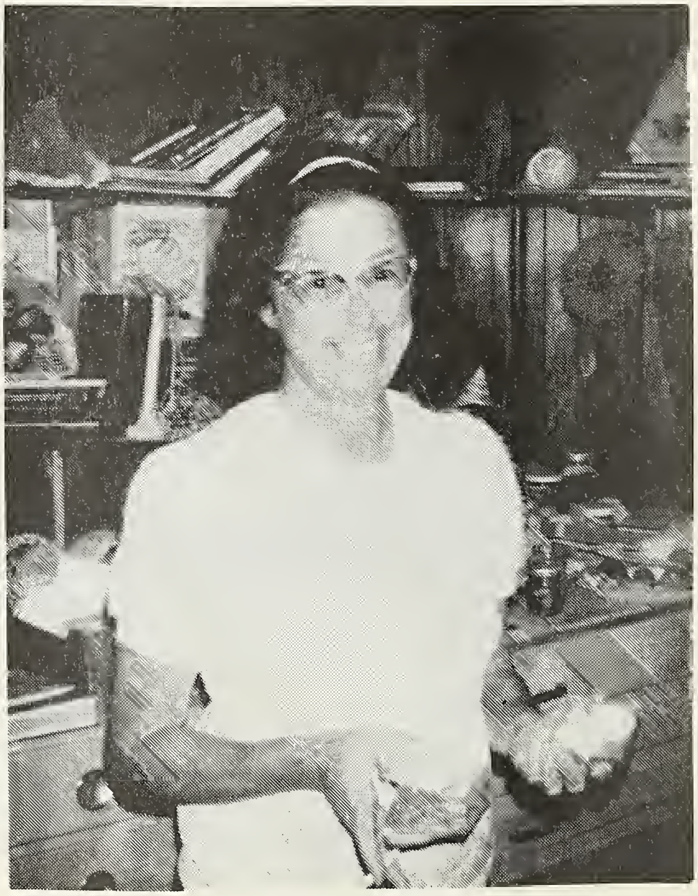


Figure 6. Joyce Gemmell in San Felipe in 1971.

For the next eleven years, Joyce explored the collecting areas around San Felipe, with occasional forays to Puertecitos and San Luis Gonzaga, and became interested in the natural history of the area. The San Diego Natural History Museum benefitted from donations of her material: plant specimens to the Botany Department, fossil mollusks to the Paleontology Department, and Recent mollusk specimens to the Malacology Department. In addition, she observed the birds and mammals of the area, collected Indian rock tools and arrowheads, and practiced the ancient art of Gyotaku, or fish printing, with the fish her husband caught.

Joyce came to San Diego in the mid-60s to find someone who collected shells. She met Ruth Purdy, then a collector and dealer, who advised Joyce on setting up a scientific shell collection and introduced her to other collectors in San Diego and southern California.

Using old map cabinets (from Bill's former career) and cardboard trays, Joyce set up her new collection and kept accurate collecting records on file cards.

Gradually the Gemmell's trailer became a stopping-off place for shell collectors, scientists, and people interested in natural history of all kinds. Visitors generously donated all manner of equipment and supplies from writing paper to fully equipped aquaria. Because she had the aquaria, she began to observe spawning in mollusks with the aid of her microscope and drew the eggs and veligers (Gemmell, 1973a, 1973b, 1974).

During the 1960s, the only potable water in San Felipe was from wells, was highly mineralized, and not considered safe. Drinking water was hauled in by truck from Ocotillo Wells in the Imperial Valley in California. The population (mostly fishermen) fluctuated by season and was about 2,500 persons. The electricity, from generators, was subject to frequent outages. Most of the foodstuffs in the few San Felipe stores, only one of which had reliable refrigeration, was brought in from Mexicali. Huge blocks of ice were also hauled from Mexicali in refrigerated "semis" to the fishing cooperative's ice house on top of Ice House Hill at the north end of town. During summer nights the temperature in town, along the beach, went down to the low 90s F. The daytime highs on the beach were in the high 90s F. Five miles inland it was over 100°F. (The Gemmells usually spent July through September in California.)

By the 1960s, San Felipe was already a tourist area (mostly for fishermen) and there were several trailer parks and motels in town. By 1976, the population had almost doubled, and the Mexican government had plans to make San Felipe a major resort area. They had built a breakwater for the fishing fleet; construction on an international airport had begun, but there had been no commercial service; a medical clinic was constructed, giving the town a full-time medical facility for the first time; telephone service was established; and a water plant was constructed which purified local water through reverse osmosis.

In 1976, Joyce and Bill Gemmell returned to San Diego to live, and the future of her shell collection became a matter of concern. Gemmell, Myers and Hertz (1981) discussed the beginnings of their project on the Gemmell collection. At this time the collection is housed in the San Diego Natural History Museum, the bivalves already accessioned as part of the Malacology collection.

SAN FELIPE - THE PHYSICAL ENVIRONMENT

San Felipe, an arid desert community bounded by the Sierra San Pedro Martir and the northern part of Bahía San Felipe, has mild sunny winters and intensely hot summers, during which daytime temperatures may reach 120°F (AAASC, 1985), often with hot strong desert winds (Lewis and Ebeling, 1971). Rainfall is less than two inches per year and usually occurs in the summer (AAASC, 1985). Occasionally severe storms race through the area accompanied by strong damaging waves. The last such storm occurred in July 1967, causing considerable damage in San Felipe (Lewis and Ebeling, 1971).

Bahía San Felipe is a relatively shallow body of water with a sand and mud (Figure 7) substrate that gradually slopes to a depth of 49 meters, 12.5 kilometers offshore (Gemmell, Hertz and Myers, 1980:24). There is considerable annual fluctuation in water temperature in the San Felipe area. Robinson (1973), in her computer based analyses of the mean offshore sea surface temperatures for the Gulf of California, showed a low of 59°F in January and February and a high of 85°F in August and September at the approximate latitude of San Felipe (31° N). Figure 8 plots the monthly mean sea surface water temperatures over several years based on this analysis. The water temperatures in the intertidal areas are probably considerably higher during the summer months, but no figures are available. Robinson (1973:10) says in this regard that in the "regime" of "the shallow water north of the islands there is a large annual temperature range at the surface and a small one at 400 ft." She also measured the average salinity in the northern Gulf (p. 13) as 35.58% at 31°N, 113°W.

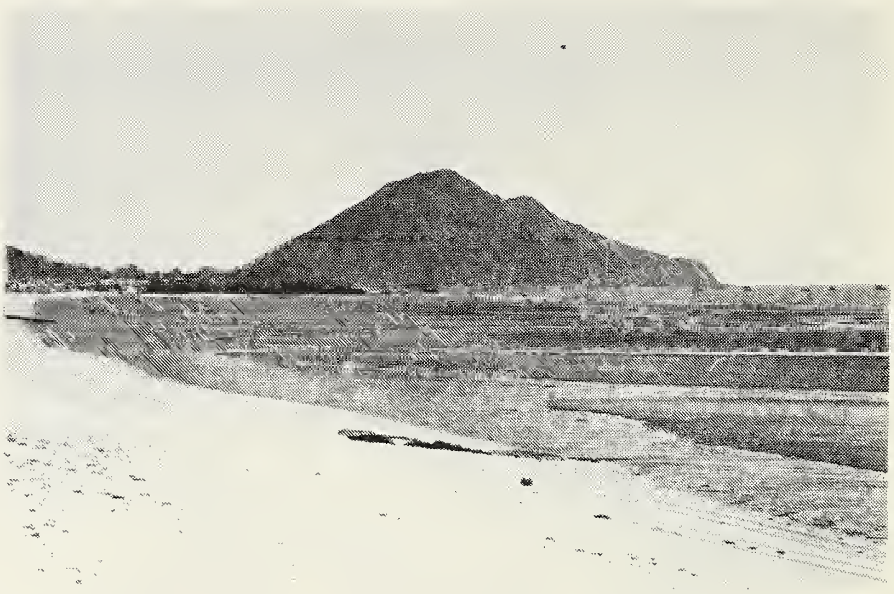


Figure 7. Bahía San Felipe looking toward Punta San Felipe in the 1960s.

In addition to the variation in water temperature in the northern Gulf--approximately 70 miles wide near San Felipe (Johnson, 1985) and 4 meters deep one mile offshore (Lewis and Ebeling, 1971)--the area has extreme tides (Figure 9) usually semi-diurnal though irregular (Thomson, 1985) which reach 6.85 meters (22.5 feet), the mean range being 3.6 meters (11.8 feet) (Lewis and Ebeling, 1971). Maluf (1983:36) states that "this large vertical displacement of water [tidal change at upper Gulf] coupled with a gentle bottom slope over most of the upper Gulf, creates enormous intertidal area (to 5 km wide)." She also discusses the complex current patterns in the northern Gulf which affect the San Felipe Bay area (pp. 33-35). For records of low and high tides at San Felipe see the tide calendars for the northern Gulf of California published by the University of Arizona, and Brusca (1980) gives a comprehensive discussion of the water temperatures, salinity, tides, and intertidal zonation in the Gulf. His introductory chapter also provides pertinent information on the physical evolution of the Gulf of California.

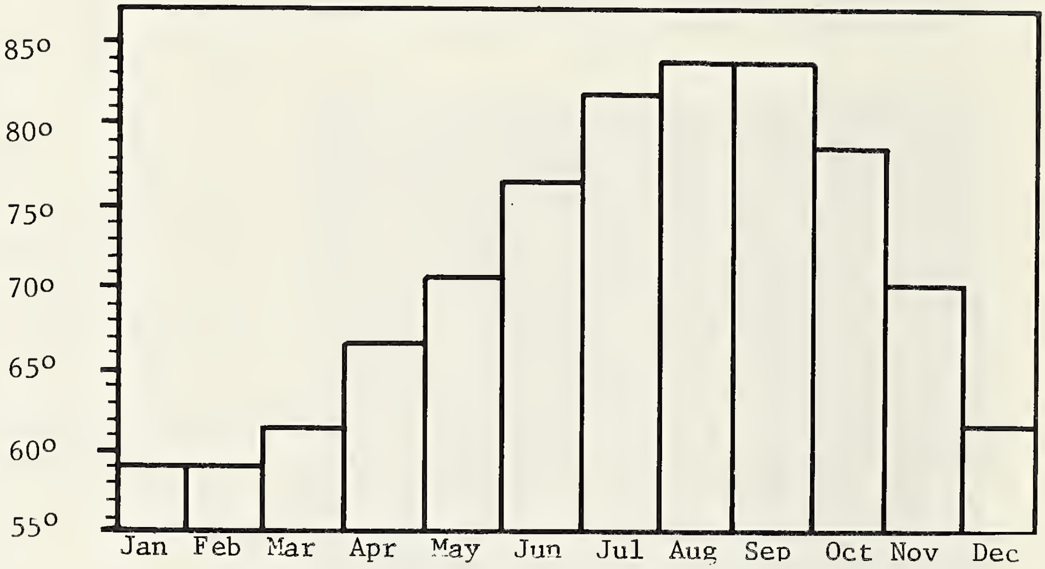


Figure 8. Graph showing mean sea surface water temperatures over several years based on Robinson (1973).

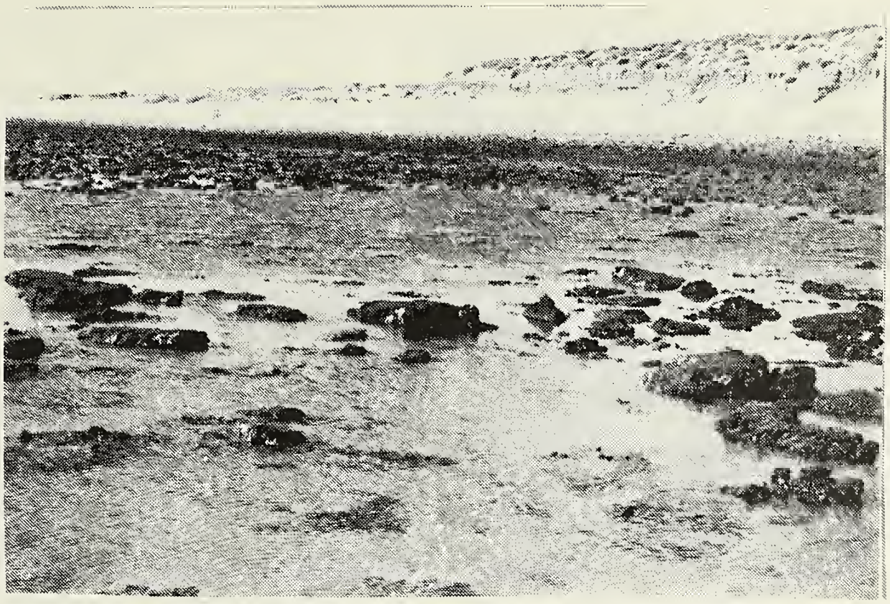
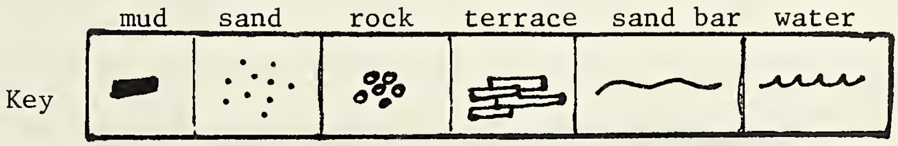


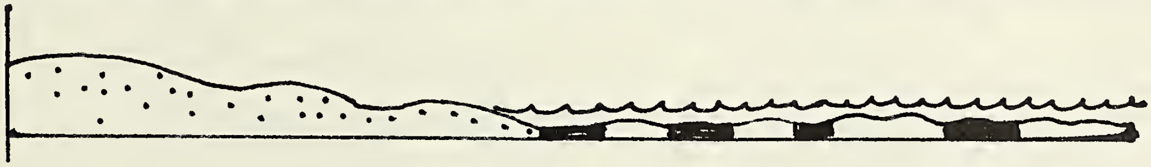
Figure 9. Radar Beach at low tide in the 1960s.

COLLECTING AREAS REFERRED TO HEREIN

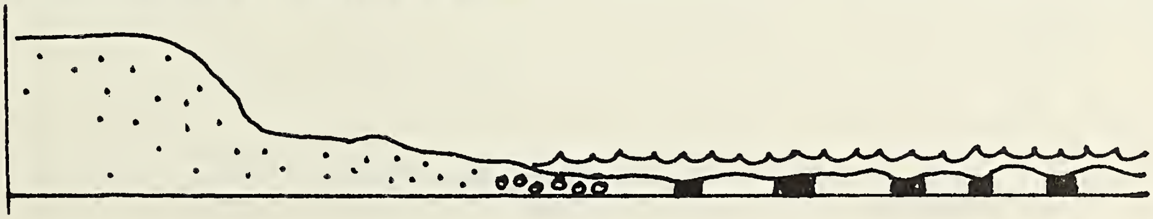
Following are descriptions and profile maps with key of the beaches at which collecting was done by Gemmell. Former beach names known to Gemmell are noted in brackets. For areas beyond Bahía San Felipe, mileages (from American Automobile Association (AAA) road maps) are calculated from the main road at the center of San Felipe town to the beach turnoffs, with the approximate mileage from the turnoff to the beach in brackets.



Estero La Ramada: 20.1 km (12.5 mi.) N of San Felipe [+ 4.2 km (2.6 mi.)]
It is an area of vast tidal flats and sand bars with an undulating bottom of soft muddy channels (constantly draining). The strong intertidal currents running parallel to the shore in this area scour the beach. It is an area almost without rocks.

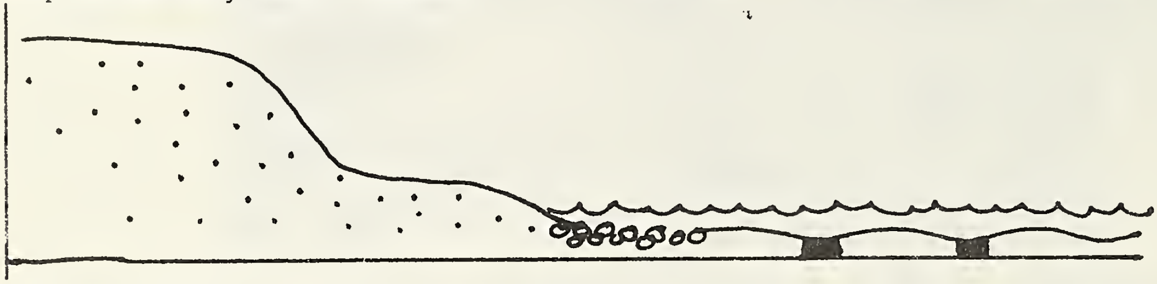


El Paraíso [Pete's Camp]: 12.9 km (8 mi.) N of San Felipe [+1.6 km. (1 mi.)]
It is a trailer park, etc., on bluffs overlooking the beach. The area has been graded for easier access to the campground and parking areas. The bluffs drop to the creamy, soft sand beach which runs several miles both north and south. Southward it is uninterrupted to Playa Blanca.

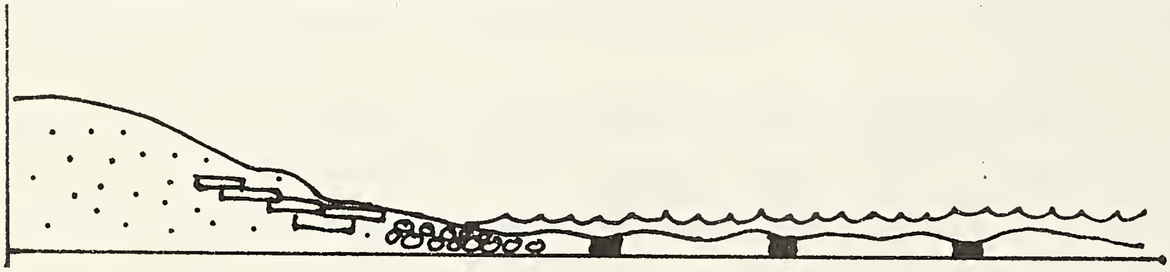


Yuma Beach: 1.6 km (1 mi.) S of El Paraíso [+1.6 km (1 mi.)] This surf fishing beach is a continuation of the beach area to the north. It is not designated on maps or noticeable from the highway. Traveling south along the beach from El Paraíso, this spot is identified by rocks at the mouth of a steep arroyo. It is a clamming area.

Playa Blanca [Clam Beach, Playa Almejas]: 8 km (5 mi.) N of San Felipe [+2.1 km (1.3 mi.)] This area has been developed into a resort with homes, trailers and camping facilities. A continuation from Estero La Ramada, it is distinguished by a large open arroyo. Since the early 1970s, there has been extensive grading of the bluffs to provide easy beach access.

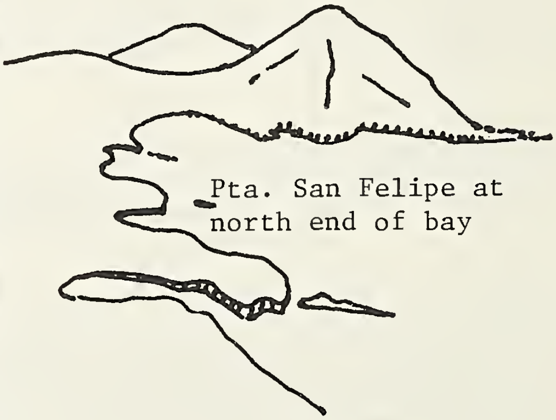


Ensenada Blanca: North side of Punta San Felipe with no highway access, a gravel road from town leads to the beach. This is a small bay between two rocky points. The intertidal area is composed of sandbars and rock. At an extreme minus tide, the rocks at the north end of the bay can be traversed to the adjacent beach, an area of marine terraces and tidepools. To the south at Punta San Felipe, gorgonians were exposed at extreme low tides.

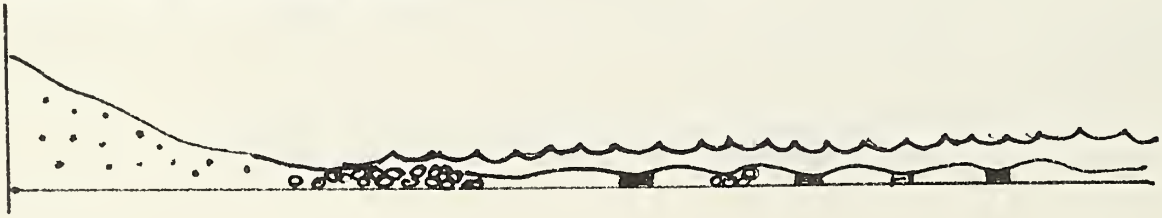


Punta San Felipe: The mountainous north point of San Felipe Bay, which in the following catalogue refers to sites not otherwise designated in the northern curve of the bay.

Campo Uno [Rudy's Camp]: In town at the foot of the shrimp freezing plant in the south curve of Punta San Felipe. Campo Uno was a very popular collecting area because it has a combination of sand, mud, tidepools and turnable rocks. From Campo Uno, east around the base of the mountain, the rocks become boulders and it is difficult to reach the point. This area now receives the waste water from the shrimp plant.

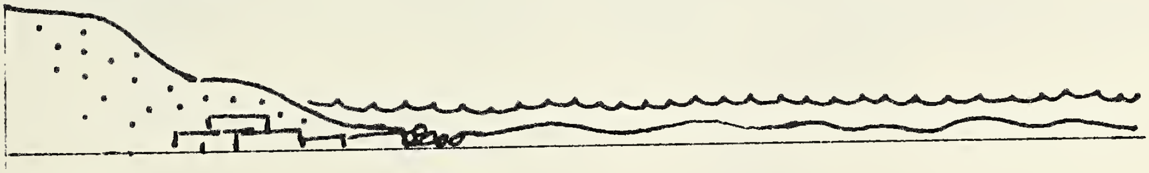


Pta. San Felipe at north end of bay



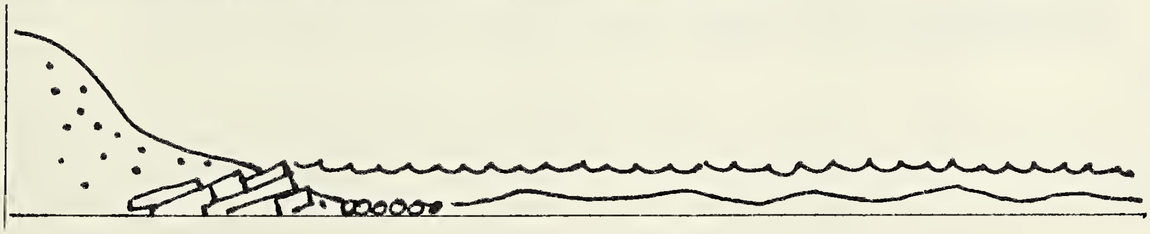
Bahía San Felipe: From Punta San Felipe, the bay follows a crescent-shaped coastline S to Punta Estrella, approximately 19.3 km (12 mi.) by road (AAASC, 1985). It is generally sandy south of the ice house. (Since the years that Gemmell collected, a marina and fishing pier have been built on the bay south of town.) Offshore, at extreme minus tides, some rocky outcroppings are exposed. Bahía San Felipe is only 5.5 m (3 fm.) deep one mile offshore (Lewis and Ebeling, 1971) gradually sloping to a depth of 49.4 m (27 fm.) 20 miles offshore east of Consag Rock. In the following catalogue the locality "Bahía San Felipe" refers to this large intertidal area. Map I gives a general view of the San Felipe area from north of Punta San Felipe to Punta Estrella.

Punta Estrella: Reached by paved town road. This is the broad mountainous headland at the southernmost point of Bahía San Felipe. Extensive sand flats are exposed at extreme minus tides and it is an area of strong currents. Punta Diggs 4 km (2.5 mi.) S of Punta Estrella is listed on navigational charts as a landmark (Lewis and Ebeling, 1971).

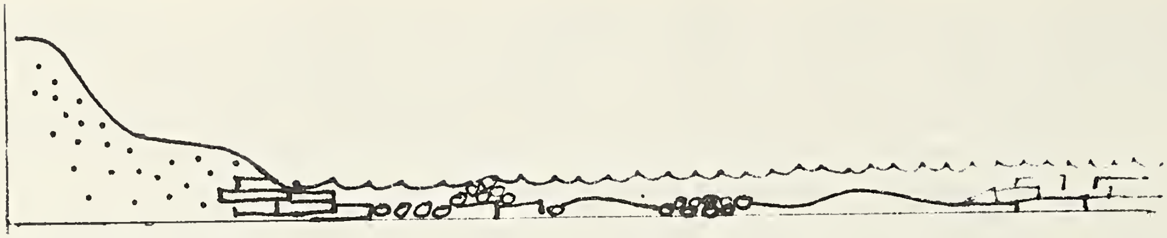


Consag Rock: This guano-covered rock, sometimes called Ship Rock because of its shape, is 29.8 km (18.5 mi.) east-northeast of Punta San Felipe and is 87.2 m (286 ft.) above water. The main rock has at its base a group of detached boulders which run westward for 0.8 km (0.5 mi.) next to the main rock. The waters close to the rock vary from 9.1-12.8 m (5-7 fm.) to 36.6 m (20 fm.) about 0.8 km (0.5 mi.) from the rock (Lewis and Ebeling, 1971). Mollusks from this area were all collected by dredging. See DuShane and Brennan (1969).

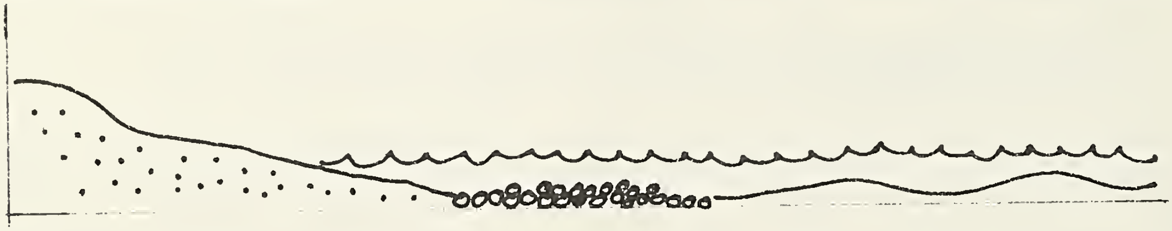
Radar Beach [Playa Estrella]: 16 km (10 mi. approx.). A paved road from town to Hotel Fiesta San Felipe becomes a graded road to Radar Beach (AAASC, 1985), constructed after Gemmell's residence in San Felipe ended. This beach was named for the radar station built there during World War II. At the base of the beach slope are embedded rocks and a large expanse of sand flat. This is an area of uplifted marine fossil terraces. Huge blocks of fossil gastropods encased in a rock matrix are within walking distance of the access area.



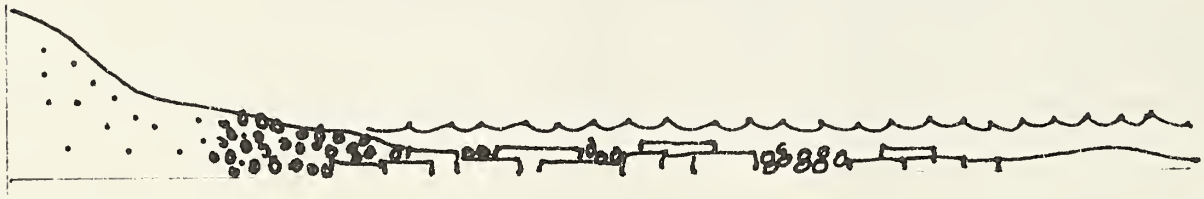
Playa Alicia [Porvenir]: 9.7 km (6 mi. approx.). Because road conditions have changed since Gemmell collected here, we can only list the mileage to this beach with certainty by noting its distance of approximately 1.6 km (1 mi.) north along the beach from Percebu. Playa Alicia is the first wide arroyo north and has rocks at the mouth. At the foot of the beach slope, at the mouth of the arroyo, are turnable rocks. On the north side of the arroyo mouth are fractured terraces leading toward the low sandy intertidal. On extreme minus tides, raised marine terraces are revealed (possibly a continuation of those in the high intertidal). The terraces drop abruptly into an area thick with sargassum. South of the arroyo at the foot of the beach slope are sand flats with rocky patches. See Map II for the route from Punta Estrella to Puertecitos Bay.



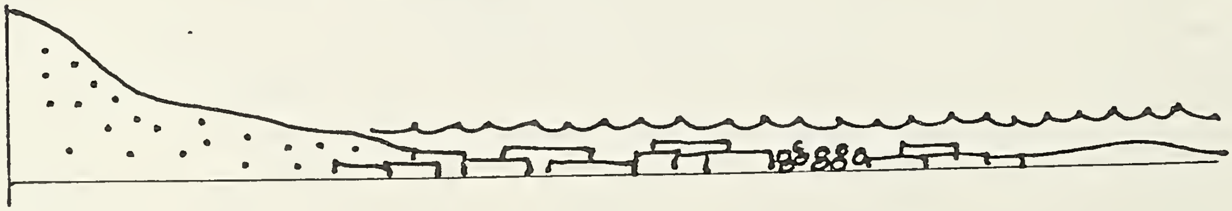
Percebu [Laguna Percebu]: 23.2 km (14.4 mi.) from junction of Highway 5 and airport road (AAASC, 1985) [+1 km (0.6 mi.)]. This area has a campsite and slopes to a wide sand and rocky beach. Straight out from the camp is an expanse of turnable rocks, exposed when the tide is lower than -1.2 m (-4 ft.). Beyond the rocks are sandbars, south of which a channel carries water into a narrow lagoon behind a sandspit. To reach the seaward side of the sandspit, one can wade the channel (only on a minus tide). The force of the water is swift, and stingrays, prevalent in the area, are particularly fond of the channel. The footing in the channel is uneven and caution is urged.

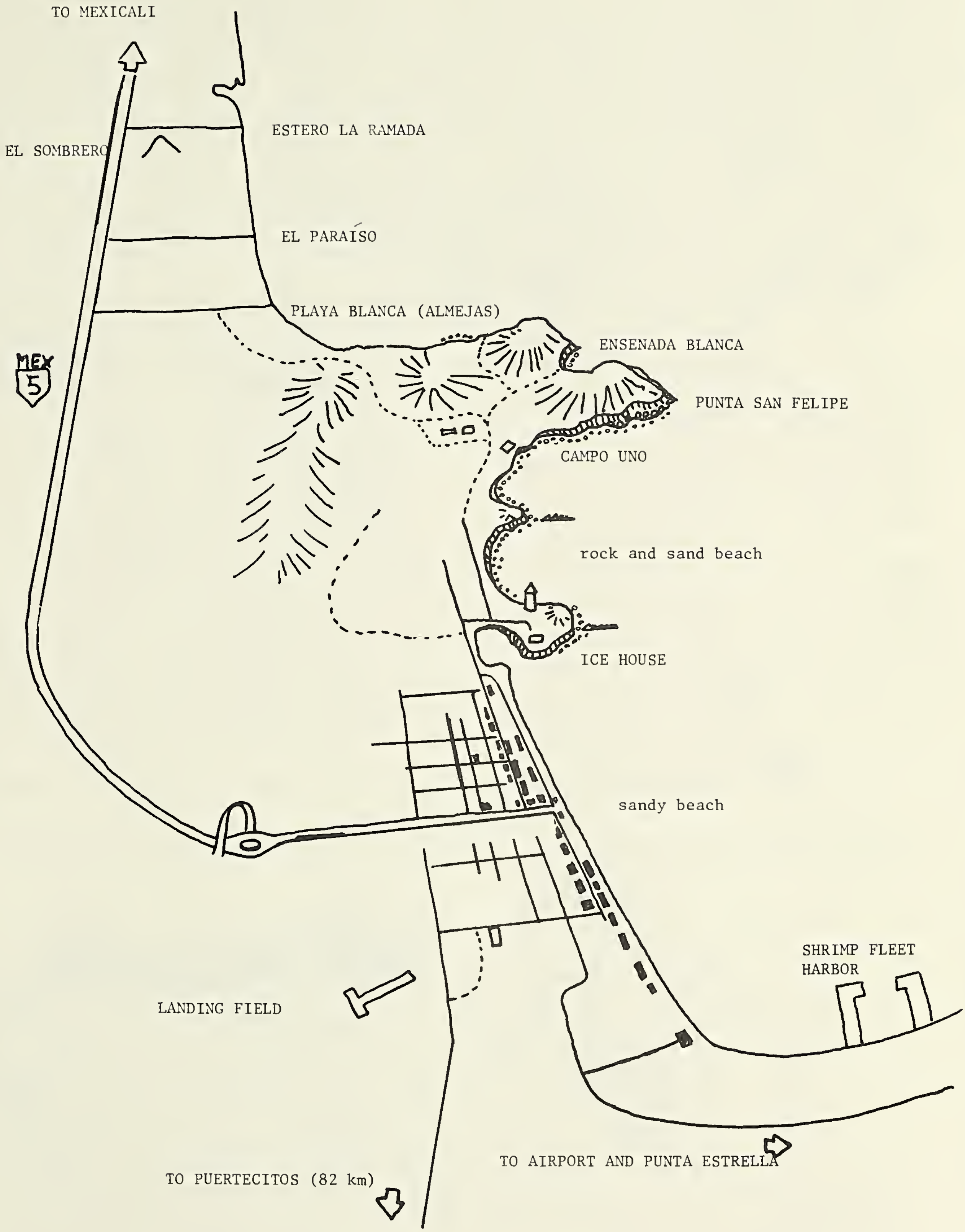


Twenty-eight Miles South [Cadena]: This fishing beach is 45.1 km (28 mi.) S of San Felipe and 9.7 km (6 mi.) S of the abandoned sulphur mine [0.8 km (0.5 mi)]. The desert road to the beach follows the bottom of an arroyo. The steep rock rubble and sand beach slopes to marine terraces with tidepools exposed at low tide. From this beach south to Puertecitos the beaches have more intertidal rocky areas.

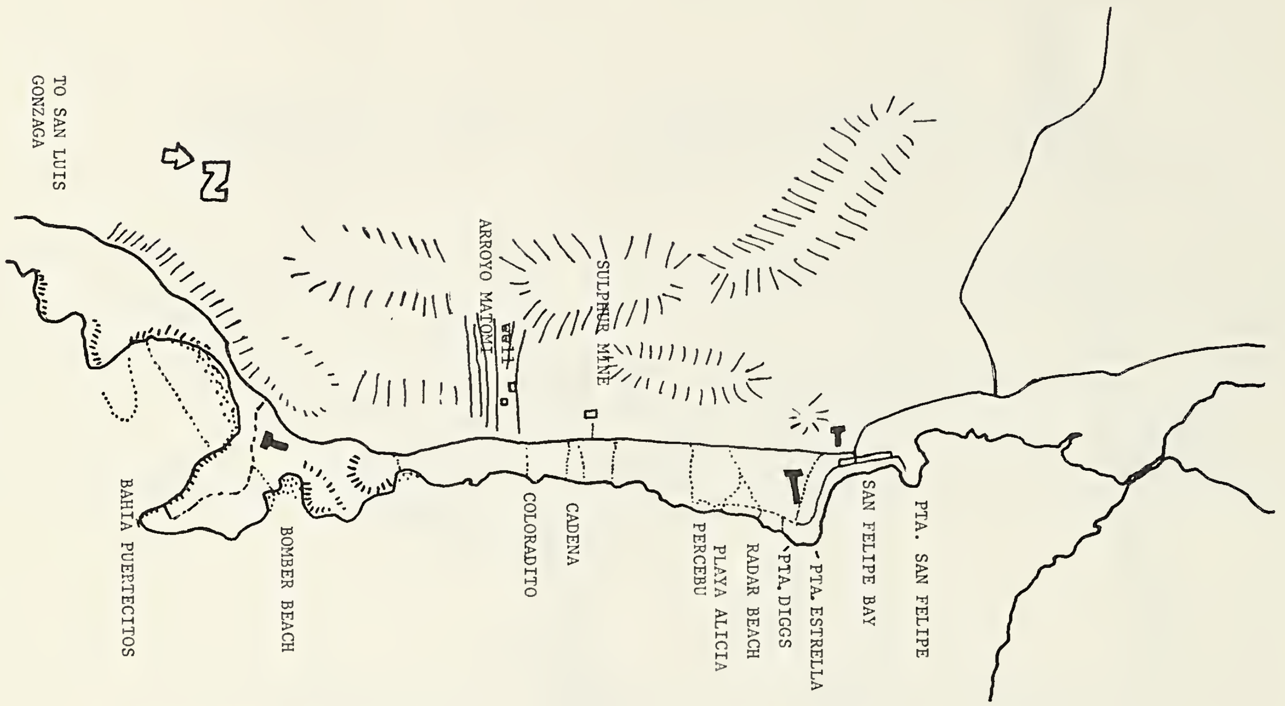


Coloradito: Approximately 48.3 km (30 mi.) S of San Felipe to the turnoff just N of the beginning of the Matomi Wash [+1.6 km (1 mi.)]. The desert road is gravel to the primitive fish camp at the base of the arroyo. The beach is a continuation of the marine terrace type formation of the previous beach, having eroded terraces with algae-filled tidepools. South of Coloradito, the marine terrace formations continue with sandy areas between.

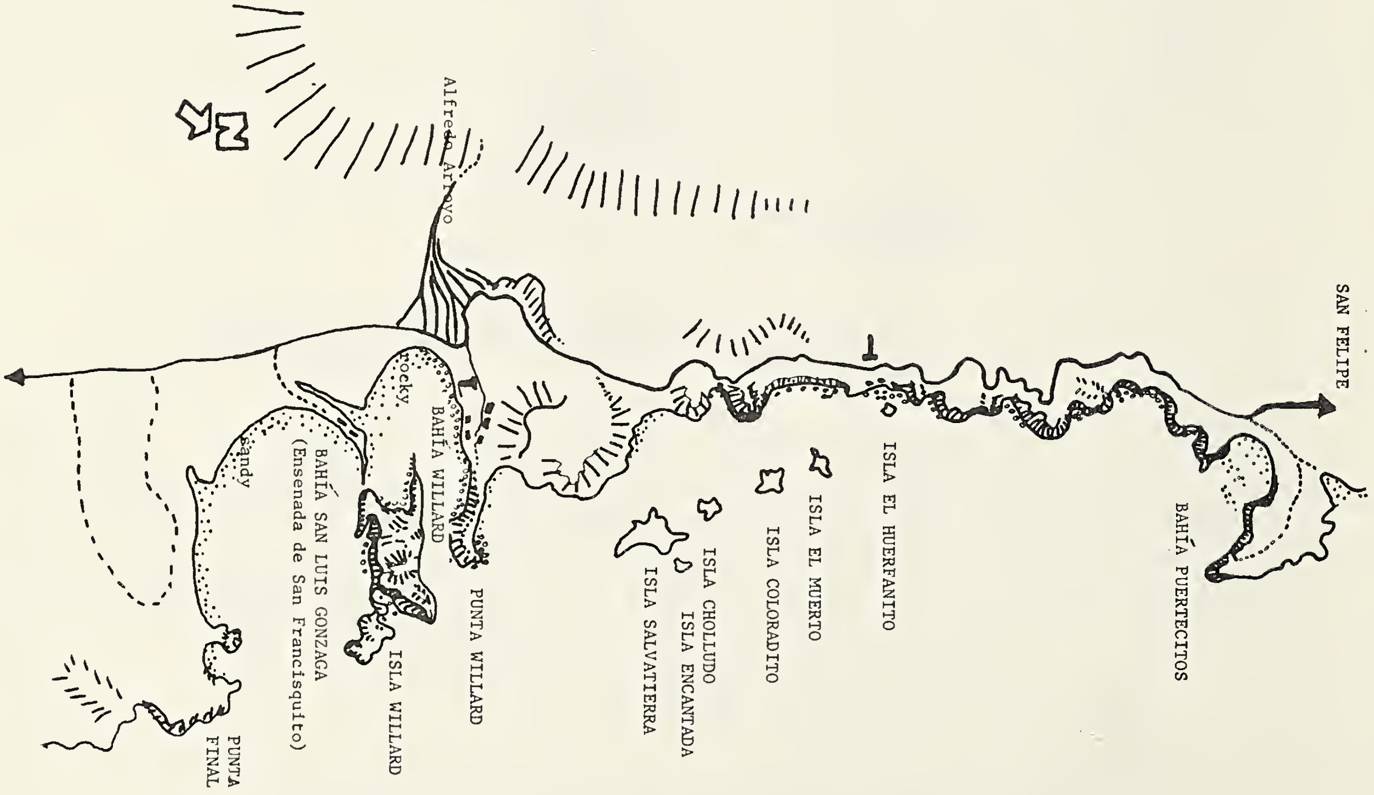




MAP I--SAN FELIPE AREA



MAP II--SAN FELIPE TO PUERTECITOS



MAP III--BAHIA PUERTECITOS TO BAHIA SAN LUIS GONAZGA

Puertecitos: (30°24'N; 114°38'W) 82.1 km (51 mi.) S of San Felipe over rock road. This is a small village with motel and camping facilities overlooking a shallow, southeastward facing bay (Lewis and Ebeling, 1971; AAASC, 1985). This bay has been a popular collecting area. However, the increased population has adversely affected it and the mollusks living there can no longer safely be used as a food source, even though the bay flushes with the tides. Intertidally, the sand-bottomed bay has rocky areas on both sides. It drains almost to the boat ramp (Map II) on a minus spring tide, revealing a series of sand bars. A small cove of pumice sand about 1.6 km (1 mi.) N of Puertecitos [Bomber Beach] was also a collecting area.

Between Puertecitos and San Luis Gonzaga lie the group of six islands called Islas Las Encantadas [The Enchanted Islands]. Three of the islands mentioned in the text (from north to south) are El Huerfanito, El Muerto (also called Isla Miramar), and Isla San Luis (also called Isla Salvatierra). See Map III which shows the area from Bahía Puertecitos to Bahía San Luis Gonzaga.

San Luis Gonzaga [Ensenada de San Francisquito]: (29°48'N; 114°24'W) is used here to describe an area bounded by Punta Willard to the north and Punta Final to the south. There are two bays, Willard and Gonzaga. Bahía Willard, the more northerly of the two, is small and sheltered. Gonzaga, to the south, is a large open bay with open sandy beaches and few rocky areas. Almost separating the two bays is Isla Willard; at low tide a sandspit on the north end of Bahía San Luis Gonzaga extends to the west side of Isla Willard. This side of the island is steep and rocky with muddy pockets and there are stonefish in this area.

A channel between Punta Willard and Isla Willard is the only access to the shallow Bahía Willard, the tidal range of which is about 4.6 m (15 ft.) (DuShane and Sphon, 1968). On the north side of Punta Willard is a small sandy beach while the north part of Bahía Willard is mostly large boulders. Further into the curve of Bahía Willard, the rocks become smaller. A sandy substrate is exposed here only at extreme minus tides. Approximately at the center of the curve of the bay offshore are submerged marine terraces. The southern portion of the bay becomes shallow with mud flats and sand bars revealed at low tide.

TWENTY-THREE SPECIES NEWLY REPORTED (SINCE 1979) FROM THE SAN FELIPE AREA

The species are listed below in taxonomic order with catalog page numbers. Those with an asterisk were reported by the authors in The Festivus, 1980-1984.

Solemya (Petrasma) valvulus Carpenter, 1864................................
Nucula (Ennucula) colombiana Dall, 1908...............................
*_Nuculana costellata_ (Sowerby, 1833)...................................
Adrana exoptata (Pilsbry and Lowe, 1932).............................
Barbatia alternata (Sowerby, 1833)......................................
Barbatia illota (Sowerby, 1833)...
Gregariella chenui (Récluz, 1842)..
Pinna rugosa Sowerby, 1835...
Isognomon quadratus (Anton, 1837).......................................
Myrakeena angelica (Rochebrune, 1895)................................
*_Parahyotissa (Pliohyotissa) quercinus_ (Sowerby, 1871)...................
Codakia distinguenda (Tryon, 1872)..
Diplodonta inezensis (Hertlein and Strong, 1947).......................
*_Diplodonta orbellus_ (Gould, 1850)...
Lepton lediforme Olsson, 1961...
Aligena obliqua Harry, 1969..
Mysella cf. _grippi_ (Dall, 1912)...
Pythinella sublaevis (Carpenter, 1857)...................................
*_Chama buddiana_ C.B. Adams, 1852..

Chama frondosa Broderip, 1835..
*_Tivela argentina_ (Sowerby, 1833)..
*_Tellina reclusa_ Dall, 1900...
Tellina (Scissula) virgo Hanley, 1844.....................................
*_Tellina ulloana_ Hertlein, 1968...
*_Macoma siliqua_ (C.B. Adams, 1852)..
Strigilla serrata (Mörch, 1860)...
Semele lenticularis (Sowerby, 1833).......................................
Solen pfeifferi Dunker, 1862..
Barnea subtruncata (Sowerby, 1834)..
*_Pandora cornuta_ C.B. Adams, 1852...
Entodesma inflatum (Conrad, 1837)...
Periploma cf. lagartilla Olsson, 1961.....................................

FORMAT FOR THE ANNOTATED CATALOGUE OF BIVALVES FROM THE SAN FELIPE AREA COLLECTED BY JOYCE GEMMELL

The species listed are arranged systematically following Keen (1971). Subgeneric classification is generally omitted, being used only in discussion when necessary for clarification. Where generic classifications differ from Keen, the assignments are ours.

Included for each species listed is the original citation and figure, a figure reference from Keen (1971) in most cases and, when appropriate, additional illustrations are provided herein. All original drawings were by Gemmell, drawn with the aid of a camera lucida attachment to a Wild dissecting microscope. All photographs, unless otherwise indicated, are the work of Mr. David K. Mulliner. The figure numbers enclosed in brackets indicate these drawings or photographs.

Synonyms which, in our opinion, refer to the species in question are listed. Published synonyms which we have been unable to evaluate have not been included.

This is followed by collecting information for the Gemmell material: San Diego Natural Histoy Museum (SDNHM) accession number for each lot (with Gemmell collection numbers in parentheses for material previously published); number of specimens in the lot; length (L) or longest dimension of specimens; locality; ecological information; and date collected when known.

All species were collected in the intertidal zone unless otherwise noted. Those species collected from the area on the beach marked by the previous high-tide line are noted here as collected in "drift." The term "grunge" is used to designate specimens that were sorted out of substrate samples of mud, sand or shell matter.

Some of the material was dredged, most obtained on trips aboard the Mexican shrimpboat Chamizal. In 1968 a dredging trip off Consag Rock was organized by Ellen Brennan of the Conchological Club of Southern California and is referred to herein as Chamizal I (Gemmell, 1968; DuShane and Brennan, 1969). A second trip, also sponsored by the Conchological Club of Southern California aboard the Chamizal (Chamizal II herein) dredged from Puertecitos to Bahía San Luis Gonzaga (Gemmell, 1969). Latitudes and longitudes for dredged material are given when known and were prepared by William Gemmell at the time of each dredge tow.

An entry contains "Remarks" when necessary for clarification. Distribution information is given and species not previously reported from San Felipe are noted with two asterisks (**). When applicable, the distribution from Keen (1971) is included as well as the degrees of latitude from Bernard (1983). Distances are noted in kilometers with miles included in parentheses since the maps of the area are listed in miles. Feet instead of meters are used for tidal measurement following the Tide Calendar for the Northern Gulf of California prepared by the Department of Ecology and Evolutionary Biology, University of Arizona. The Gulf of California is herein referred to as the Gulf.

ACKNOWLEDGMENTS

We are indebted to many people for their help in the preparation of this paper. The following individuals and their institutions made the loan of type and study material available to us as well as giving helpful information: George M. Davis and Mary Garback of the Academy of Natural Sciences of Philadelphia; William K. Emerson and Walter E. Sage III, American Museum of Natural History; Solene Morris, British Museum of Natural History; Terrence M. Gosliner and Robert Van Syoc, California Academy of Sciences; Alan Solem, Field Museum of Natural History; James H. McLean and Gale G. Sphon, Los Angeles County Museum of Natural History; Kenneth J. Boss, Ruth D. Turner and David H. Backus, Museum of Comparative Zoology, Harvard; Rudo von Cosel, Museum National d'Histoire Naturelle, Paris; Richard S. Houbrick and the late Joseph Rosewater, National Museum of Natural History, Smithsonian Institution; F.G. Eric Hochberg, Barry Roth and Paul H. Scott, Santa Barbara Museum of Natural History; Jørgen Knudsen, Universitetets Zoologiske Museum, Copenhagen.

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Hans Bertsch, former Curator of Marine Invertebrates, San Diego Natural History Museum, invited our project into the department. Jules Hertz reviewed early drafts of the paper and gave helpful suggestions. Theo Fusby carefully and patiently typed the many drafts of the paper. David K. Mulliner did all the photography, illustrating many of the species, and carefully reproduced prints from the San Diego Natural History Museum photo archives.

Anthony D'Attilio, Acting Chairman of the Department of Marine Invertebrates at the San Diego Natural History Museum gave constant encouragement and advice and critically read the paper. R. Tucker Abbott, Eugene V. Coan and William K. Emerson critically reviewed the paper. Jules Hertz proofread the final manuscript.

We are grateful to the San Diego Shell Club for their support in the publication of this paper and to Carol Skoglund whose generous donation covered the cost of converting the photographs to halftones for printing.

ANNOTATED CATALOGUE OF BIVALVES FROM THE SAN FELIPE AREA COLLECTED BY JOYCE GEMMELL FROM 1965 TO 1976

SOLEMYIDAE

*******Solemya (Petrasma) valvulus* Carpenter, 1864a**

Ann. Mag. Nat. Hist. ser. 3, vol. 13:311-312

Figure reference: Keen #3; Gemmell, Myers and Hertz (1979, fig. 5)

SDNHM 86741 (ex G-333), 4 spec., 15.0-20.0 mm L, Bahía San Felipe, after storm, freshly dead on flats, 25 Aug. 1967

Remarks: See Gemmell, Myers and Hertz (1979, vol. 11(9):73-76) for a discussion of *S. (P.) valvulus* and *S. (P.) panamensis* Dall, 1908

Distribution: Bernard (1983) gave distribution as 21N to 33N but did not indicate if this includes the Gulf. Keen (1971) gave the distribution as San Pedro, California to Sonora, Mexico.

NUCULIDAE

Nucula (Nucula) declivis Hinds, 1843c

Proc. Zool. Soc. London 1843:98 [Fig'd Hinds (1845, pl. 18, fig. 8)]

Figure reference: Keen #4

SDNHM 86742 (ex G-335), 1 spec., 2 mm L, Chamizal I, [30°41' to 30°51'12"N, 114°32' to 114°41'W]from Pta. Estrella S 35.4 km (22 mi.) approx. 4.8 km (3 mi.) offshore in 9.1 to 18.3 m, 27 June 1968

SDNHM 86743, 9 v., 3-4 mm L, Playa Alicia, from grunge

SDNHM 86744 (ex G-335S), 1 spec., 2 mm L from seastars, Chamizal I (same locality as SDNHM 86742)

Distribution: Puerto Peñasco to Panama (Keen, 1971); 4S-31N (Bernard, 1983)

***Nucula (Ennucula) colombiana* Dall, 1908

Bull. MCZ, Harvard 43(6):371-372

Figure references: Gemmell, Hertz and Myers (1980, vol. 12(3):30, fig. 5) and [Figs. 10a, 10b]

SDNHM 86745 (ex G-336S), 2 spec., each 6 mm L from seastars, Chamizal I, dredged [31°.02'30" to 31°20'18"N; 114°41' to 114°48'W in sand and mud to rocky rubble in 11-25 m off Pta. San Felipe, 28 June 1968

Remarks: In Gemmell, Hertz and Myers (1980, fig. 5) this species was referred to as *Nucula (Ennucula)* sp. After comparing the Gemmell specimens with the types of both *N (E.) linkii* Dall, 1916, and *N. (E.) colombiana* Dall, 1908, we have determined that the Gemmell specimens are conspecific with *N. (E.) colombiana*. The type of *colombiana* is smaller (4.5 mm) than the Gemmell specimens and the number of hinge teeth differ. The Gemmell specimens have 10 posterior and 18 anterior instead of 7 posterior and 14 anterior teeth, but have the light olive, highly polished periostracum and a "well-developed chondrophore" (Dall, 1908).

Distribution: Panama to Chile (Keen, 1971); 9S-17S (Bernard, 1983). Study material from Carol Skoglund of Phoenix, Arizona, also conspecific with *N. (E.) colombiana* was dredged from Bahía Concepción, Tetas de Cabras (N of Guaymas), off Isla Danzante, and San Felipe.

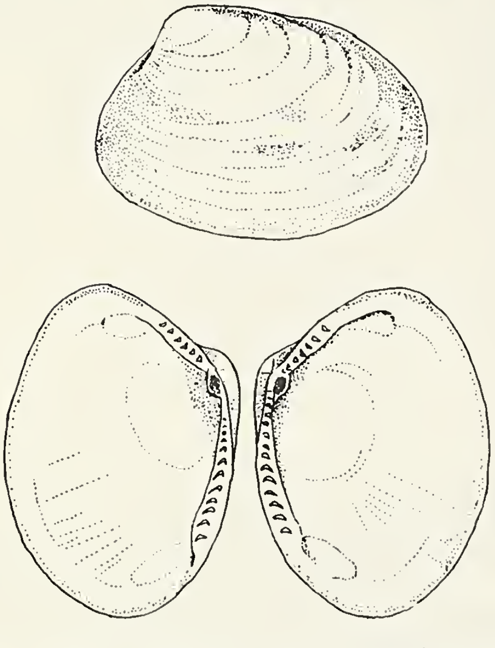


Figure 10a. *Nucula (E.) colombiana* Dall, 1908
Camera lucida drawings of interior and exterior of holotype (USNM 110686)
Size: 4.5 x 3.0 mm
Type locality: "West coast of Colombia, in Panama Bay."

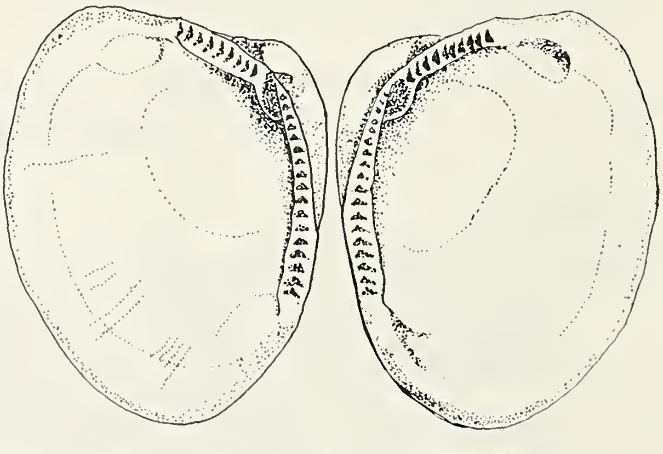


Figure 10b, *N. (E.) colombiana*
Camera lucida drawings of Gemmell specimen (SDNHM 86745)
Size: 6.0 x 4.5 mm. Dredged off Consag Rock, from seastar stomach

NUCULANIDAE

Nuculana costellata (Sowerby, 1833)

Proc. Zool. Soc, London for 1832:198 [Fig'd Sowerby II, 1833, pl. 15, fig. 8]

Figure reference: Keen #16

SDNHM 86746, 5 v., 16-19 mm L, dredged in Bahía San Felipe off Pta Estrella, Apr. 1968

SDNHM 86747 (ex G-337S), 8 spec., 4.9-9.0 mm L, Chamizal I, dredged in Bahía San Felipe, 3.2 km (2 mi.) offshore in 15.2 m on sand and mud bottom

Distribution: Santa Inez Bay, Baja California to Colombia (Keen, 1971) Gemmell, Hertz and Myers (1980:30) extended the distribution to San Felipe.

Nuculana acrita (Dall, 1908)

Bull. MCZ, Harvard 43(6):374-375

Synonym: _Leda laeviradius_ Pilsbry and Lowe, 1932

Figure reference: Keen #19

SDNHM 86748 (ex G-338S), 2 spec, 1.0 and 1.5 mm L, dredged, Chamizal I, [31°02'30" to 31°21'18"N; 114°41' to 114°48'W], found in seastar stomachs, 28 June 1968

SDNHM 86749, 14 spec. and 25 v., 3.0-13.0 mm L, dredged, found in grunge and drift in Bahía San Felipe.

SDNHM 86750, 7 v., 8.0-15.0 mm L, dredged, Chamizal II, W of N end of El Muerto, 1.6 km (1 mi.) offshore, [30°04'30"N; 114°33'42"W] on sand in 11-27.4 m, 8-10 July 1969

Distribution: Puerto Peñasco to Panama (Keen, 1971); 1N-31N (Bernard, 1983). DuShane and Brennan (1969) extended the northern distribution to San Felipe.

Nuculana impar (Pilsbry and Lowe, 1932)

Proc. ANSP 84:106-107, pl. 17, figs. 3-6

Figure references: Keen #26 and color pl. 12, fig. 1

SDNHM 86751 (ex G-339S), 13 spec., 8.0-13.0 mm L, dredged, Chamizal I [30°04'30"N; 114°33'42"W] on sand in 11-27.4 m, 1.6 km (1 mi.) offshore

SDNHM 86752, 6 spec., 5.2-9.8 mm L and 25 v., 7.0-17.0 mm L, collected living in Bahía San Felipe at -4.0 ft. tide

SDNHM 86753, 21 v., 7.0-16.0 mm L, valves in drift at Pta. San Felipe and N 12.8 km (8 mi.)

Remarks: Gemmell collected this species as far south as Puertecitos.

Distribution: Punta Peñasco (northern range) to Costa Rica (Keen, 1971); 11N-31N (Bernard, 1983). DuShane (1962) found the species at Puertecitos and DuShane and Brennan (1969) extended the northern distribution to the San Felipe area.

**_Adrana exoptata_ (Pilsbry and Lowe, 1932)

Proc. ANSP 84:107-108, pl. 17, figs. 8,9

Figure reference: Keen #39

SDNHM 86754, 17 v., 6.0-20.0 mm L, dredged off Pta. Estrella in 9.1 m, Apr. 1968

Remarks: The original description states that the sculpture is of threadlike concentric lines anteriorly which straighten and slope toward the ventral margin. Olsson (1961, pl. 3, fig. 6) illustrated this sculpture which is also apparent on the Gemmell specimens.

Distribution: Guaymas to Oaxaca (Keen, 1971); 1N-28N (Bernard, 1983)

Adrana penascoensis (Lowe, 1935)

Trans. San Diego Soc. Nat. Hist. 8(6):18, pl. 1, fig. 8

Figure references: Keen #40 and color pl. 12, fig. 2

SDNHM 86755, 8 spec., 9.0-41.0 mm L and 12 v., 12.0-51.5 mm L, found dead on beach after storm, El Paraíso (Pete's Camp) N of San Felipe, 21 Oct. 1967

Distribution: Type locality=Puerto Peñasco. "reported only in the northern end of the Gulf..." (Keen, 1971); Guaymas (DuShane and Poorman, 1967); 28N-31N (Bernard, 1983)

ARCIDAE

Arca mutabilis (Sowerby, 1833)
Proc. Zool. Soc. London for 1833:17 [Fig'd Reeve (1844(2) *Arca*, pl. 13 fig. 85)]
Figure references: Keen #66 and Olsson (1961, pl. 6, figs. 2a-d). For detail of periostracum see [Figure 11]
SDNHM 86756, 6 spec., 19.0-22.6 mm L, Puertecitos
SDNHM 86757, 5 spec., 22.0-30.0 mm L, San Luis Gonzaga
SDNHM 86758, 1 v., 5 mm L, dredged off San Luis Gonzaga
Remarks: Except for a dredged valve, all specimens were found under rocks attached by byssus
Distribution: Bahía Magdalena through the Gulf and S to Ecuador (Keen, 1971); 2S-25N (Bernard, 1983)

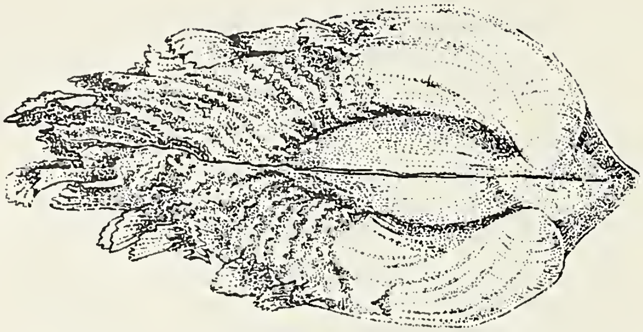


Figure 11. *Arca mutabilis* (Sowerby, 1833) Gemmell specimen (SDNHM 86757) showing periostracum, 20.5 x 12.1 mm.

Arca pacifica (Sowerby, 1833)
Proc. Zool. Soc. London for 1833:17 [Fig'd. Reeve (1844(2) *Arca*, pl. 11, fig. 75)]
Figure reference: Keen #67
SDNHM 86759, 3 spec., 30.0-100.0 mm L, Pta. San Felipe on extreme minus tides
SDNHM 86760, 2 spec., 26.0 and 31.0 mm L, Playa Alicia, on reef at -4.0 ft. tide
Distribution: Scammon's Lagoon to Peru (Keen, 1971); Puertecitos (DuShane, 1962); San Luis Gonzaga (DuShane and Sphon, 1968); 5S-28N (Bernard, 1983)

*******Barbatia alternata* (Sowerby, 1833)
Proc. Zool. Soc. London for 1833:17 [Fig'd Reeve (1844(2) *Arca*, pl. 13, fig. 88)]
Figure reference: Keen #73 [from Reinhart (1943)]
SDNHM 86761, 1 v., 15 mm L, dredged Chamizal II [30°04'30"N; 114°33'42"W] W of N end of El Muerto, 1.6 km (1 mi.) offshore in sand, in 10.9-27.4 m, 8-10 July 1969
Distribution: Pta. Peñasco to Ecuador (Keen, 1971); 1S-27N (Bernard, 1983)

Barbatia reeveana (Orbigny, 1846)
Voy. Amer. Merid. Moll. 5(3):635-636
Synonyms: *B. nova* Mabille, 1895; *B. reeveana lasperlensis* Sheldon and Maury, 1922; *B. reeveana velataformis* Sheldon and Maury, 1922
Figure reference: Keen #74
SDNHM 86762, 2 spec., 28.0-36.0 mm L, Bahía Willard, San Luis Gonzaga, 20 Apr. 1966
Distribution: Throughout the Gulf to Peru (Keen, 1971); 4S-34N (Bernard, 1983)

*******Barbatia illota* (Sowerby, 1833)
Proc. Zool. Soc. London for 1833:18 [Fig'd Reeve (1844(2) *Arca*, pl. 12, fig. 78)]
Synonym: *Arca tabogensis* C.B. Adams, 1852
Figure references: Keen #75, Olsson (1961, pl. 6, figs. 1, 1a, 1b)
SDNHM 86763, 4 spec., 25.0-40.2 mm L, San Luis Gonzaga, under rocks, 20 Apr. 1966
SDNHM 86764, 5 spec., 11.5-22.8 mm L, San Felipe, at minus tide, Mar. 1968
SDNHM 86765, 7 spec., 20.0-27.0 mm L, Puertecitos
Remarks: Fine radial ribbing shows on the inside of the shell; periostracum is fringed at the ventral margin. We retain the genus *Barbatia* although Bernard (1983) placed this species in *Fugleria* Reinhart, 1937 which he raised to generic status.
Distribution: Isla Angel de la Guarda to Lobitos, Peru (Keen, 1971); Puertecitos (DuShane, 1962); 4S-29N (Bernard, 1983)

Anadara concinna (Sowerby, 1833)
Proc. Zool Soc. London for 1833:20
Synonym: *Arca cumingiana* Nyst, 1848 [replacement name, fide Keen (1971)]
Figure references: Keen #78 and Olsson (1961. pl. 8, figs. 1, 1a)

SDNHM 86766, 1 spec., 12.0 mm L, dredged, Chamizal II, off Isla Salvatierra [29°57'48"N; 114°28'00"W] 0.8 km (0.5 mi.) offshore in 25 m in sand and broken shell bottom, 8-10 July 1969

Remarks: Olsson's Figures 1 and 1a show a left and right valve of two different specimens. In Figure 1, a left valve, the anterior ribs are grooved; in Figure 1a, a right valve, no grooving is apparent on the anterior ribs. Our study material showed sculptural differences within lots, i.e., some have ribs grooved anteriorly and some do not in both valves. We checked material from SBMNH (4 lots) and it is our considered opinion that this is a variable character.

Distribution: San Luis Gonzaga to Ecuador (Keen, 1971); 0-29N (Bernard, 1983)

Anadara multicostata (Sowerby, 1833)

Proc. Zool. Soc. London for 1833:21 [Fig'd Reeve (1844(2) *Arca*, pl. 4, fig. 23)]

Figure reference: Keen #90

SDNHM 86767, 3 spec., 40-127 mm L, Bahía Willard, San Luis Gonzaga, intertidal at minus tide, 1965-1966

SDNHM 86768, 1 v., 43.3 mm L, Campo Uno, Bahía San Felipe

SDNHM 86769, 87 spec., 5-16 mm L, dredged Chamizal II [29°57'48" to 30°94'30"N; 114°28'00" to 114°33'42"W] in 11-25 m, in sand and pumice, 8-10 July 1969

SDNHM 86770 (ex G-347S), 1 spec., 3 mm L, dredged Chamizal I [30°41' to 30°51' 12"N; 114°32' to 114°41'W] in 9 to 18 m, on sandy bottom, 27 June 1968

Distribution: West coast of Baja California through the Gulf and S to Panama and Galapagos Is., with a report from Newport Bay, California (Keen, 1971); 0-34N (Bernard, 1983)

Arcopsis solida (Sowerby, 1833)

Proc. Zool. Soc. London for 1833:18 [Fig'd Reeve (1844(2) *Arca*, pl. 16, fig. 106)]

Synonym: *Barbatia digueti* Mabille, 1895

Figure references: Keen #99, Olsson (1961, pl. 6, figs. 3-3b)

SDNHM 86771, 9 spec., 5.0-16.0 mm L, collected at minus tides from Pta. San Felipe to San Luis Gonzaga, 1964-1968

Distribution: West coast of Baja California through the Gulf to Peru (Keen, 1971): 9S-29N (Bernard, 1983)

GLYCYMERIDIDAE

Glycymeris gigantea (Reeve, 1843)

Proc. Zool. Soc. London 1843:33-34 [Fig'd Reeve (1843(1) *Pectunculus*, pl. 1, figs. 3a, 3b)]

Figure reference: Keen #110

SDNHM 86772, 1 v., 112 mm L, intertidal, Bahía Willard, San Luis Gonzaga, 1966

SDNHM 86773, 2 v., 61.0 and 61.4 mm L, intertidal, Bahía Willard, San Luis Gonzaga, 1967

Distribution: Bahía Magdalena to Acapulco and the Gulf (Keen, 1971); Willard and Gonzaga bays (DuShane and Sphon, 1968); 25N-31N (Bernard, 1983)

Glycymeris maculata (Broderip, 1832)

Proc. Zool. Soc. London 1832:126

Figure reference: Keen #112

SDHNM 86774, 8 spec., 13.0-54.0 mm L and 3 v., 8.3-8.5 mm L, Radar Beach, just S of Pta. Estrella, and S on sandy beaches, intertidal and in drift N of Pta. San Felipe

SDNHM 86775 (ex G-352S), 3 spec., 5 mm L, dredged by shrimpboat in 15 m, found in seastar stomachs, Bahía San Felipe, 11 Nov. 1971

Distribution: Northern Gulf and west coast of Baja California to Peru (Keen, 1971); 4S-31N (Bernard, 1983)

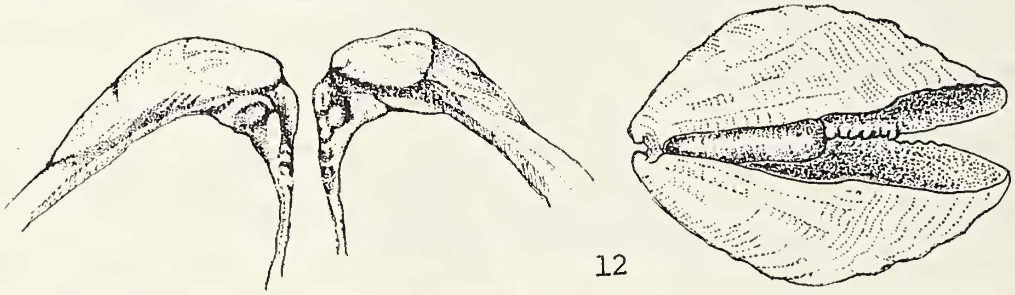
Glycymeris multicostata (Sowerby, 1833)

Proc. Zool. Soc. London for 1832:195-196 [Fig'd Reeve (1843 (1) *Pectunculus*, pl.5, figs. 2,6)]

Synonyms: *Pectunculus bicolor* Reeve, 1843; *P. minor* Orbigny, 1846; *Glycymeris chemnitzii* Dall, 1909
Figure reference: Keen #116
SDNHM 86776, 9 spec., 12.4-30.2 mm L, and 4 v., 20-29 mm L, Bahía Willard, San Luis Gonzaga, intertidal
SDNHM 86777, 1 spec. and 4 v., 4-5 mm L, in grunge, San Luis Gonzaga, 1971
SDNHM 86778, 29 spec. and 5 v., 4.8-12.0 mm L, dredged, Chamizal II, San Luis Gonzaga [30°04'54"N; 114°34'W] in 18 m on sand, 8-10 July 1969
Distribution: Pta. Penasco to Guayaquil, Ecuador (Keen, 1971); 2S-31N (Bernard, 1983)

MYTILIDAE

Brachidontes adamsianus (Dunker, 1857)
Proc. Zool. Soc. London for 1856:360
Synonym: *Mytilus stearnsi* Pilsbry and Raymond, 1898
Figure references: Keen #119 and [Figures 12, 13, 14]
SDNHM 86779, 5 spec. and 3 v., 9.0-18.5 mm L, Puertecitos, found alive on rocks and in drift
Remarks: Based on anatomical studies, *Hormomya*, Mörch, is placed in the synonymy of *Brachidontes* Swainson, 1840 (Kenk, *in litt.*). We are illustrating this species and details of the hinge.
Distribution: S. California through the Gulf to Ecuador and Galapagos (Keen, 1971); 1S-34N (Bernard, 1983)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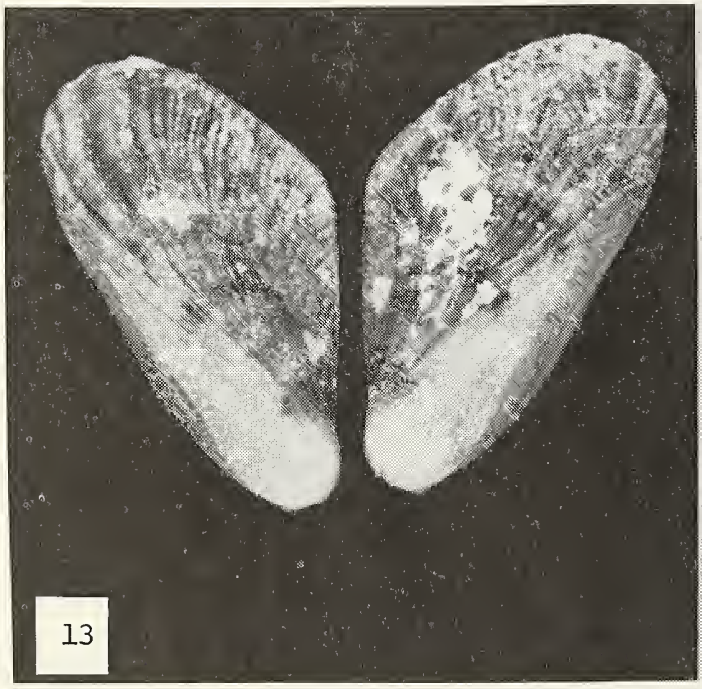
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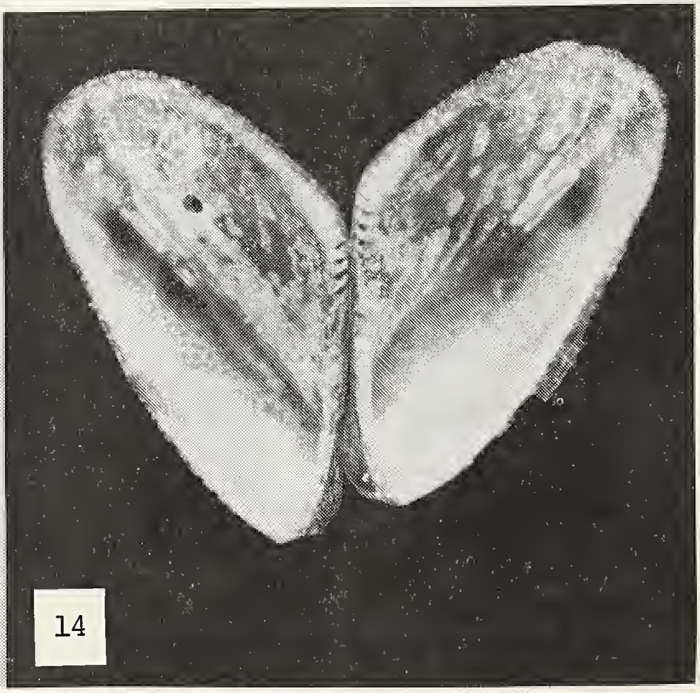
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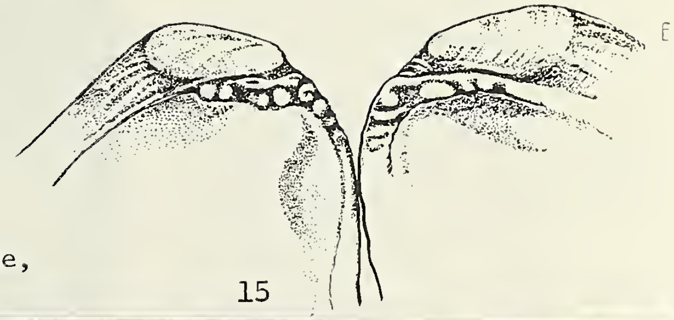
Figures 12-14. *Brachidontes adamsianus* (Dunker, 1857), Gemmell specimen (SDNHM 86779), 10 mm L, found alive on rock at Puertecitos. 12) camera lucida drawings of ligamental area. 13) exterior view. 14) interior view.

Brachidontes semilaevis (Menke, 1848)
Zeits. für Malac. Fünf. Jahr.:5
Synonyms: *Mytilus multiformis* Carpenter, 1857;
Scolimytilis aequatorialis Olsson, 1961
Figure references: Keen #122 and [Figures 15, 16, 17]
SDNHM 86780, 25 spec. and 1 v., 4.0-15.0 mm L, Yuma Beach, 32.2 km (20 mi.) N of Pta. San Felipe on cobbles and oysters in low tide zone
Distribution: Northern Gulf to Peru (Keen, 1971); Puertecitos (DuShane, 1962); 5S-31N (Bernard, 1983)



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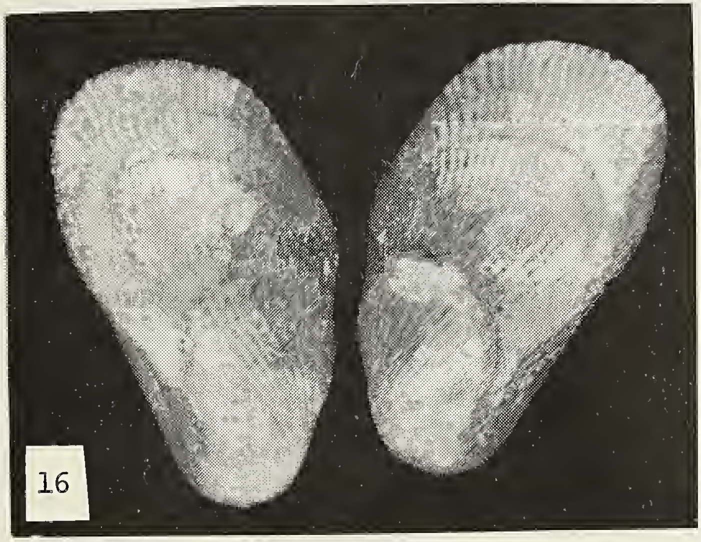

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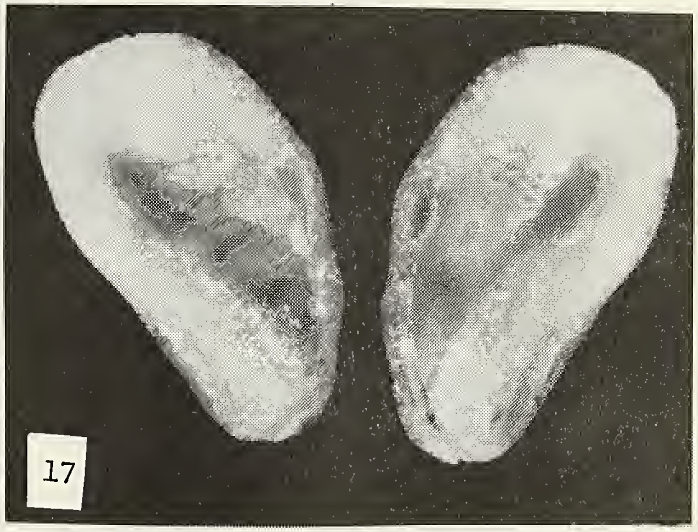

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Figures 15-17. *Brachidontes semilaevis* (Menke, 1848), Gemmell specimen (SDNHM 86780), 8.0 mm L. Yuma Beach, on rock. 15) camera lucida drawing of hinge and teeth. 16) exterior view. 17) interior view.

Mytella guyanensis (Lamarck, 1819)
Hist. nat. des anim. sans verteb. 6(1):112 [Fig'd Delessert (1841, pl. 13, fig. 9)]
Synonyms: *Modiola sinuosa* King and Broderip, 1832;
M. mutabilis Carpenter, 1857
Figure references: Keen #125, Olsson (1961, pl. 12, figs. 8, 8a)
SDNHM 86781, 13 spec. and 1 v., 35-90.0 mm L, N of Pta. San Felipe among rocks
Distribution: Laguna de San Ignacio and Bahía Magdalena and northernmost part of the Gulf to Paita, Peru (Soot-Ryen, 1955); Puerto Peñasco to northern Peru (Keen, 1971); 3N-31N (Bernard, 1983)

Septifer zeteki Hertlein and Strong, 1946
Zoologica 31(5):71, pl. 1, figs. 1,2
Synonym: *Septifer cumingii* of authors [not of Recluz, 1849]
Figure reference: Keen #129
SDNHM 86782, 2 v., 5 and 6 mm L, Bahía Willard, San Luis Gonzaga, in beach drift, Mar. 1967
Distribution: "Gulf of California to Panama and the Galapagos Islands" (Hertlein and Strong, 1946); Consag Rock, San Felipe (DuShane and Brennan, 1969); Baja California to Peru (Keen, 1971); 5S-28N (Bernard, 1983)

Crenella divaricata Orbigny, 1842 [*fide* Aguayo (1943) and Abbott (pers. comm.)]
Mollusques. In Sagra. Hist. physique, polit.... l'Ile de Cuba: Atlas, pl. 27, figs. 56-59
Figure references: Keen #131 and [Figure 18]

SDNHM 86783, 7 spec., and 13 v., 1.8-3.0 mm L, dredged S of Isla El Huerfanito, 1.6 km (1mi.) offshore [30°04'30"N; 114°33'42"W], 10-27 m, in sand, July 1969

Remarks: There seems to be confusion concerning the dates of Orbigny's species in Sagra. This is a rare work which we have not seen. Aguayo (1943:34-40) established the date for parts 8-24 of Orbigny's work (pp.113-380) as "1847-1853(?)" with the Atlas dated 1842. R. Tucker Abbott (pers. comm.) also advised us that the Sagra plates [French edition] are dated 1842. See Keen (1971:65) for a discussion of the status of this species.

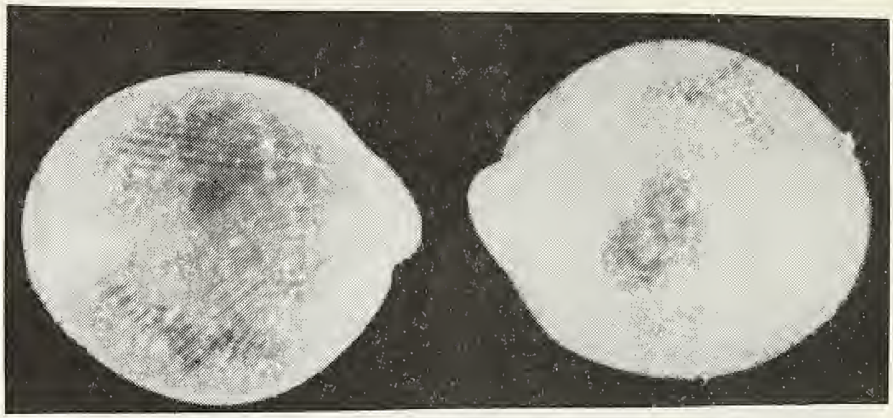


Figure 18. *Crenella divaricata* Orbigny, 1842 Interior (L.V.), exterior (R.V.) of Gemmell specimen (SDNHM 86783), 3 mm L, dredged off Isla El Huerfanito.

Distribution: S. California through the Gulf, and S to Peru (Keen, 1971); 2S-34N (Bernard, 1983)

***Gregariella chenui* (Récluz, 1842)

Rev. Zool. Soc. Cuvierienne 5:306

Synonym: *Modiola opifex* [of authors, not Say, 1825]

Figure references: Keen #132 and Soot-Ryen (1955, pl. 8, fig. 40)

SDNHM 86784, 1 v., 8 mm L, dredged Chamizal II, W of N end of El Muerto, 1.6 km (1 mi.) offshore [30°04'30"N; 114°33'42"W] in 10-27 m, in sand, July 1969

SDNHM 86785, 1 spec., 6 mm L and 2 v., 3-4 mm L, 41.8 km (26 mi.) S of San Felipe, intertidal at low tide on sponge spicules on *Pinna rugosa* Sowerby, 1835

SDNHM 86786, 3 spec., 1.8-3.0 mm L and 6 v., 4.0-4.6 mm L, dredged Chamizal I, off Consag Rock, San Felipe, on shells of *Pteria sterna* (Gould, 1851), June 1968

Remarks: The Gemmell specimens have branched hairs posteriorly separating them from *Gregariella coralliophaga* (Gmelin, 1791) [=*G. coarctata* (Carpenter, 1857) *fide* Bernard (1983)] which has smooth hairs. The holotype is noted as from Brazil. Hertlein and Grant (1972); Keen (1971); and Soot-Ryen (1955) agree the species is found on both the east and west coasts of North America.

Distribution: Valves in drift from Monterey, California to Peru, and the Atlantic (Keen, 1971); 13S-37N (Bernard, 1983)

Lioberus salvadoricus (Hertlein and Strong, 1946)

Zoologica 31(5):73, pl. 1, figs. 7-11

Figure reference: Keen #135

SDNHM 86787, 3 spec. (with bodies and mud particles) 20-22 mm L; 12 spec., 6-25 mm L, and 14 v., 12-23 mm L, Bahía San Felipe, intertidal at low tide after storm, 1967

SDNHM 86788 (ex G-359S), 2 spec., 2.0-4.0 mm L and 3 v., 4 mm L, dredged, Chamizal I near Pta. San Felipe [31°02'30"N to 31°20'18"N and 114°41'W to 114°48W'] in substrate varying from sand and mud to embedded rock rubble, in 10.9-25.6 m, 28 June 1968

SDNHM 86789, 3 spec., 3-5 mm L, dredged, Chamizal II, W of N end of El Muerto

1.6 km(1mi.) offshore [30°04'30"N; 114°33'42"W] in 10-27 m, in sand, July 1969
Distribution: N of San Felipe to Costa Rica (Keen, 1971); 11N-31N (Bernard, 1983)

Lithophaga (Diberus) plumula (Hanley, 1844a)
Proc. Zool. Soc. London for 1843:17 [Fig'd Hanley (1856, pl. 24, fig. 23)]
Figure reference: Keen #138
SDNHM 86790, 1 spec., 44.0 mm L, Bahía Willard, in beach drift
Remarks: The subgenera of *Lithophaga* Röding, 1798, are based on the incrustation of the shell and the sculpture on the posterior portion. In this genus the subgenera are extremely helpful in identification. The subgenus *Diberus* Dall, 1898, is characterized by two or more radial sulci dividing the valves and extending posteriorly from the umbos. *L.(D.) plumula*, the type of the subgenus, has a groove which divides the pattern of the periostracum diagonally from the umbos. The incrustations on the posterior, which often project beyond the valves, are plumelike.

Wilson(1979) suggested that, based on his studies of Queensland, Australia species, the genus *Lithophaga* might be divided into two genera with the subgenera *Diberus, Myoforceps, Labis* and *Myapalmula* falling into synonymy. Since the type species of most of the subgenera above are American, he believed it unwise to take this action until their anatomy has been studied and compared with the Queensland species. Waller (1983) found differences in the periostracal structure of *Lithophaga* which he believes support Wilson's generic separation. If their studies confirm these findings, the available names would be *Lithophaga* Röding, 1798, for the non-encrusted group and *Leiosolenus* Carpenter, 1856 for the encrusted group.

Distribution: The Gulf to Peru (Keen, 1971); 4S-40N (Bernard, 1983)

Lithophaga (Labis) rogersi Berry, 1957 [fide Bernard, 1983]
Leaf. in Malac. 1(14):76 [Fig'd C.M. Hertz (1984, fig. 12)]
Figure reference: Keen #140
SDNHM 86791, 5 spec., 12-79 mm L, Bahía Willard, boring in *Spondylus calcifer* Carpenter, 1857
Remarks: We are using *Labis* Dall, 1916, because the species has a smooth projecting posterior incrustation which is flattened interiorly. Kleeman (1983:3) considers *L. (L.) attenuata rogersi* a synonym of *L. attenuata* (Deshayes, 1836).
Distribution: S. California through the Gulf to southern Mexico (Keen, 1971); 17N-33N (Bernard, 1983)

Lithophaga (Leiosolenus) spatiosa (Carpenter, 1857)
Cat. Coll. of Mazatlan Shells in Brit. Mus.:130-131 [Fig'd Keen (1968, pl. 55, figs. 7a, 7b)]
Synonyms: *Lithophagus rugiferus* Carpenter, 1857 [ex Dunker MS *nom. nud.*]; *Lithophaga abbotti* Lowe, 1935
Figure references: Keen #142 and 142a (*abbotti*)
SDNHM 86792, 4 spec. and 6 v., 25-36 mm L, San Felipe, boring in soft rock and *Pteria sterna* (Gould, 1851)
Remarks: The Gemmell specimens are very similar to the holotype of *L. abbotti* (SDNHM 50611). Photos in Keen (1966, 1971) are the Carpenter holotype. Keen (1966) explained that Carpenter's shell appears more slender because it has curled in drying and the ventral margin has bent inward.
Distribution: San Felipe to Ecuador (Keen, 1971); 2S-31N (Bernard, 1983)

Lithophaga (Myoforceps) aristata (Dillwyn, 1817)
A Descrip. Cat. of Recent Shells...1:303-304

Synonyms: (eastern Pacific only)
Dactylus carpenteri Mörch, 1861; *Modiola caudigera* Lamarck, 1819; *Lithophagus aristatus gracilior* Carpenter, 1857; *L. aristatus tumidior* Carpenter, 1857
Figure references: Keen #143 and [Figure 19]
SDNHM 86793, 12 spec., 6-27 mm L, Bahía Willard, on *Chama buddiana* C.B. Adams, 1852, 28 Apr. 1967
Remarks: Species in *Myoforceps* Fischer, 1886, have a smooth incrustation which extends beyond the posterior end of the valves. The crossed posterior pointed projections are the distinguishing feature of the subgenus of which *L. (M.) caudigera* Lamarck, 1819, is the type.
Distribution: Type locality =West Africa. Eastern Pacific from S. California to Peru (Keen, 1971); 4S-33N (Bernard, 1983)

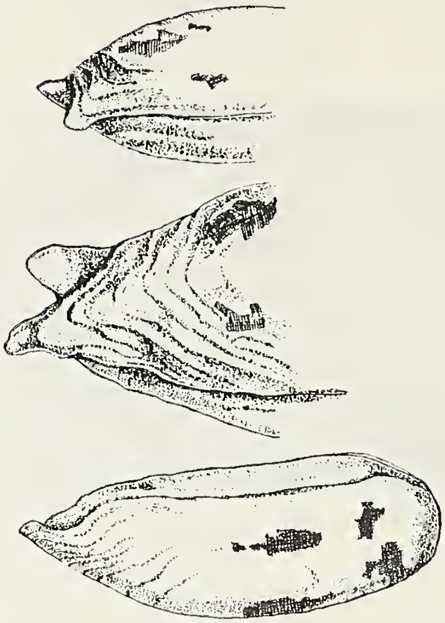


Figure 19. *Lithophaga aristata* (Dillwyn, 1817). Gemmell specimen (SDNHM 86793), 13.3 mm L showing "the crossed pointed projection."

Modiolus capax (Conrad, 1837)
Jour. ANSP 7(2):242-243
Figure reference: Keen #149
SDNHM 86794, 6 v., 25-100 mm L, Pta. San Felipe to Playa Alicia, attached to rocks in low tide zone
Distribution: Santa Cruz, California, to Paita, Peru (Keen, 1971); 5S-35N (Bernard, 1983). J. Hertz (1980:135) found the species at Whidbey Is., Washington.

PINNIDAE

***Pinna rugosa* Sowerby, 1835
Proc. Zool. Soc. London for 1835:84 [Fig'd Reeve (1858(11) *Pinna*, pl. 26, fig. 50)]
Figure references: Keen #156 and Olsson (1961, pl. 18, fig. 1)
SDNHM 86795, 1 spec., 244 mm L, Coloradito, among stones, intertidal
SDNHM 86796, 1 spec., 123 mm L, El Paraíso, intertidally, among stones
SDNHM 86797, 1 spec., 125 mm L, Campo Uno, intertidally among stones
Distribution: Southern Baja California, through the southern Gulf to Guaymas and S to Panama (Keen, 1971); 10N-28N (Bernard, 1983)

Atrina tuberculosa (Sowerby, 1835)
Proc. Zool. Soc. London for 1835:84 [Fig'd Reeve (1858(11) *Pinna*, pl. 25, fig. 48)]
Figure reference: Keen #160
SDNHM 86798, 2 spec., 130 and 205 mm L, Pta. San Felipe, living, among rocks
SDNHM 86799, 3 spec., 80-85 mm L, 8.0 km (5 mi.) N of Pta. San Felipe, among rocks
SDNHM 86800, 16 spec., 32-69 mm L, Radar Beach, in beach drift, dead
Distribution: The Gulf to Panama (Keen, 1971); Consag Rock [dredged] (DuShane and Brennan (1969); 5S-28N (Bernard, 1983)

PTERIIDAE

Pteria sterna (Gould, 1851)
Proc. Boston Soc. Nat. Hist. 4:87 [Fig'd Gould (1853, pl. 16, fig. 7)]
Synonyms: *Avicula fimbriata* Dunker, 1852; *A. peruviana* Reeve, 1847; *Pteria beiliana* Olsson, 1961
Figure reference: Keen #161

SDNHM 86801, 1 spec., 130 mm L, Punta Final, S of San Luis Gonzaga, alive from deep water, on fishhook, 25 Apr. 1966
SDNHM 86802, 1 cluster of juveniles on gorgonian, 10-35 mm L, Bahía San Felipe, on minus tide
SDNHM 86803, 1 v., 86 mm L, dredged off Consag Rock, June 1969
Remarks: Measurements of length on these shells taken from beaks to farthest point at ventral margin, excluding periostracum
Distribution: Baja California, through the Gulf and S to Peru (Keen, 1971); 5S-34N (Bernard, 1983)

ISOGNOMONIDAE

Isognomon janus Carpenter, 1857
Cat.. Coll. of Mazatlan Shells in Brit. Mus. pp. 151, 152 [Fig'd Brann (1966 pl. 17, fig. 206) and Keen (1968, pl. 55, fig. 10)]
Figure references: Keen #163 and Myers and D'Attilio (1979, figs. 1,2)
SDNHM 86804, 9 spec., 32-72 mm L and 1 v., 60 mm L, Bahía San Luis Gonzaga, common under rocks, 20 Apr. 1966
SDNHM 86805, 1 spec., 25.5 mm L, Ensenada Blanca, N. of Pta. San Felipe, alive under rock
Remarks: For further information on this species see Myers and D'Attilio (1979)
Distribution: San Ignacio Lagoon to Oaxaca (Keen, 1971); 16N-34N (Bernard, 1983); Pt. Loma, San Diego, California (Myers and D'Attilio, 1979)

***Isognomon quadratus* (Anton, 1837)
Archiv. f. Naturgeschicte 3:285
Synonyms: *Perna chemnitziana* of authors [not of Orbigny, 1846]; *P. recognita* (Mabille, 1895)
Figure reference: Keen #164 [as *Isognomon recognitus*]
SDNHM 86806, 6 spec., 20-35 mm L, Pta. San Felipe, alive under rocks at minus tides
Remarks: Keen (1971:79-80) used the name *Isognomon recognitus* for this species. Bernard (1983:22) placed *I. recognitus* in the synonymy of *I. quadratus* (Anton). Anton (1837) described *quadrata* as a *Perna* and J. de Carle Sowerby had already named a *Perna quadrata* in 1825 (Min. Conch. V, pt. 2: 149). However, the two are not homonyms because the *quadrata* of Anton is an *Isognomon* while that of Sowerby appears to us to be in the Ostreacea. [See ICZN (1985, Art. 59(c))]. For further discussion of this species [as *I. recognitus*] see Myers and D'Attilio (1979:79-81).
Distribution: Baja California to Chile (Keen, 1971); Puertecitos (DuShane, 1962); Guaymas (DuShane and Poorman, 1967); Gonzaga (DuShane and Sphon, 1968); 2S-26N (Bernard, 1983)

GRYPHAEIDAE

Parahyotissa quercinus (Sowerby, 1871)
In Reeve, 1871(18) *Ostrea*, pl. 19, sp. 43
Figure reference: Gemmell, Hertz and Myers (1985:43-47, figs. 1-8); Keen (1971) did not include this species.
SDNHM 86807 (ex G-370), 7 spec., 50-78 mm L, Pta. San Felipe, found alive under rocks at low tide
Remarks: For discussion of this species see Harry (1985) and Gemmell, Hertz and Myers (1985)
Distribution: Gemmell, Hertz and Myers (1985) list the species from San Felipe S on the west side of the Gulf to Cabo San Lucas, also Puerto Vallarta and Manzanillo.

OSTREIDAE

***Myrakeena angelica* (Rochebrune, 1895)
Bull. Mus. Hist. Nat. Paris, 1:239-43 [not seen] [Fig'd Keen (1971, #167)]

Figure references: Keen #167 (lower specimen after holotype); Harry (1985, fig. 19)
SDNHM 86808, 4 spec., 35-50 mm L and 3 v., 29-39 mm L, Bahía San Felipe and N 40 km (25 mi.), on rocks
Remarks: Our method of measurement of length in the oysters is from Stenzel (1971), who stated that "length is the largest dimension obtained by projecting the extremities onto the mid-axis of the shell..." See Gemmell, Hertz, Myers (1985, fig. 5)
Distribution: The Gulf to Ecuador (Keen, 1971); Puertecitos (DuShane, 1962); Guaymas (DuShane and Poorman, 1967); 3S-29N (Bernard, 1983)

Saccostrea palmula (Carpenter, 1857)
Cat. Coll. Mazatlan Shells Brit. Mus. p.163 [Fig'd Keen (1968, pl. 55, fig. 6)]
Synonym: *Ostrea omara* Carpenter, 1864
Figure reference: Keen #174
SDNHM 86809, 2 spec., 55-57 mm L, collected alive at Puertecitos, on rocks
SDNHM 86810, 1 spec., 42 mm L, Pta. San Felipe
Remarks: Harry (1985) assigned this species to *Saccostrea* Dollfuss and Dautzenberg, 1920
Distribution: San Ignacio Lagoon, Baja California, through the Gulf to Ecuador and the Galapagos (Keen, 1971); Consag Rock (DuShane and Brennan, 1969); 1S-25N (Bernard, 1983)

PECTINIDAE

Pecten vogdesi Arnold, 1906
U.S. Geol. Surv. Prof. Pap. 47:100-101, pl. 33, fig. 1; pl. 34, fig. 1
Synonyms: *Pecten dentatus* Sowerby, 1835; *P. excavatus* of authors [not of Anton, 1839]; *P cataractes* Dall, 1914
Figure references: Keen #181 and [Figure 20]
SDNHM 86811, 280 spec., 4-80 mm L and 1 flat valve, 6 mm L, dredged Chamizal II, [30°04'54"N; 114°34'00"W] between S end of Isla El Muerto and S to San Luis Gonzaga, living specimens, 8-10 July 1969
Remarks: Valves are often found intertidally on tide flats at San Felipe and are also thrown overboard by shrimpers when they clean their nets.
Distribution: Pta. Eugenia on the outer coast of Baja California, through the Gulf to Panama (Keen, 1971); 1S-28N (Bernard, 1983)

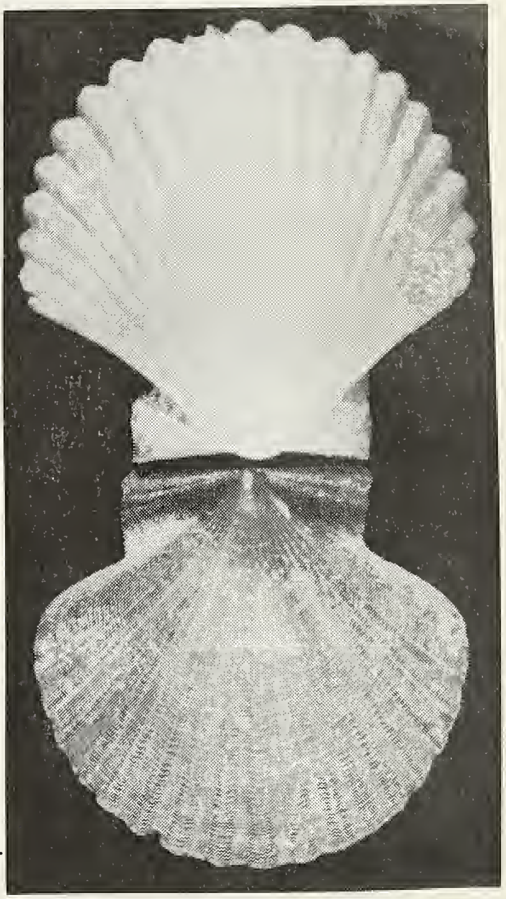


Figure 20. *Pecten vogdesi* Arnold, 1906, exterior of Gemmell specimen (SDNHM 86811), 49 mm L

Argopecten circularis (Sowerby, 1835) [not *Pecten circularis* Goldfuss, 1836]
Proc. Zool. Soc. London for 1835:110 [Fig'd Sowerby (1842(1) pl. 12, fig. 23)]
Synonyms: *Pecten tumidus* Sowerby, 1835 [not *Ostrea tumida* Turton, 1819; not *Pecten tumidus* Hartmann in Zieten, 1833]; *Pecten ventricosus* Sowerby, 1842; *P. solidulus* Reeve, 1853; *P. filitextus* Li, 1930
Figure references: Keen #182, 182a
SDNHM 86812, 40 spec., 20-61 mm L and 10 v., 15-53 mm L, Bahía San Felipe, alive among rocks and gorgonians, intertidally
SDNHM 86813, 98 spec., 2.75-15 mm L, dredged off Isla Salvatierra
SDNHM 86814 (ex G-373S), 1 v., 7 mm L,

dredged , Chamizal I, near Pta. San Felipe [31°02'30"N to 31°20'18"N; 114°41'W to 114°48'W] in 11-25.6 m, 28 June 1968

Remarks: McLean (1978:69) regards *A. aequisulcatus* (Carpenter, 1864a), a separate species "until a subspecific relationship can be demonstrated." However, Bernard (1983:24) considers *A. aequisulcatus* a synonym of *A. circularis*. For a discussion of *A. aequisulcatus*, see Palmer (1958:71, pl. 3, figs. 1-3).

Distribution: The Gulf and Isla Cedros to Peru (Keen, 1971); Puertecitos (DuShane, 1962); 5S-30N (Bernard, 1983)

Leptopecten palmeri (Dall, 1897)

Nautilus 11(8):85-86

Figure references: Keen #198 and Grau (1959, pl. 36)

SDNHM 86815, 36 spec. and 1 v., 3-54 mm L, Pta. San Felipe and to the N and S, alive, attached by byssus to rocks at extreme minus tides

SDNHM 86816, 3 spec., 6-10.5 mm L and 22 v., 3-5 mm L, dredged, Chamizal II, out of Puertecitos, 8-10 July 1969

Remarks: Dall (1897) stated that the interspaces are narrower than the ribs. Keen (1971) stated the reverse. If the ribs are measured from summit to summit, the interspaces are wider. If the ribs are measured from base to base, the interspaces are narrower.

Distribution: Confined to the Gulf (Keen, 1971); 31N (Bernard, 1983)

Lyropecten subnodosus (Sowerby, 1835)

Proc. Zool. Soc. London for 1835:109 [Fig'd Sowerby (1842(1) pl. 15, figs. 97, 112)]

Synonym: *L. intermedius* Conrad, 1867

Figure reference: Keen #202

SDNHM 86817, 2 v., 8-10 mm L, dredged off Isla Salvatierra, July 1969

Distribution: Scammon's Lagoon, Baja California to Peru (Keen, 1971); San Luis Gonzaga (DuShane and Sphon, 1968); Guaymas (DuShane and Poorman, 1967); 5S-28N (Bernard, 1983)

PLICATULIDAE

Plicatula anomioides Keen, 1958

Bull. Amer. Paleo. 38(172):241-242, pl. 31, figs. 4,7,8

Figure reference: Keen #206

SDNHM 86818, 2 spec., 30-45 mm L and 7 v., 20-45 mm L, Bahía Willard, alive under rocks, Apr. 1967

Distribution: Guaymas to Mazatlan (Keen, 1971); San Luis Gonzaga (DuShane and Sphon, 1968); 23N-28N (Bernard, 1983)

SPONDYLIDAE

Spondylus calcifer Carpenter, 1857

Cat. Coll. of Mazatlan Shells in Brit. Mus. p. 152

Figure reference: Keen #210

SDNHM 86819, 1 v., 57 mm L, Bahía San Felipe, among rocks at N end of bay

SDNHM 86820, 1 spec., 145 mm L, San Luis Gonzaga, collected alive by Mexican divers on S side of Isla Willard

Distribution: The Gulf to Ecuador (Keen, 1971); 5S-31N (Bernard, 1983)

LIMIDAE

Lima (Lima) tetrica Gould, 1851

Proc. Boston Soc. Nat. Hist. 4:87-93 [not seen] [Fig'd Gould (1853, pl. 16, fig. 6)]

Figure references: Keen #214; Gemmell, Myers and Hertz (1981, fig. 10 left)

SDNHM 86821 (ex G-377), 4 spec., 16-32 mm L, San Luis Gonzaga, alive under and between rocks on northwest side of Bahía Willard, intertidally, 22 Apr. 1967

Distribution: The Gulf to Ecuador (Keen, 1971); Guaymas (DuShane and Poorman, 1967); San Luis Gonzaga (DuShane and Sphon, 1968); 2S-30N (Bernard, 1983)

Lima (Promantellum) pacifica Orbigny, 1846 [new name for *L. arcuata* Sowerby, 1843]
Voy. Amer. Merid. 5:64
Synonyms: *L. arcuata* Sowerby, 1843 [not Geinitz, 1840]; *L. galapagensis* Pilsbry and Vanatta, 1902
Figure references: Keen #219 and color pl. 12, fig. 5 and [Figure 21]
SDNHM 86822, 12, spec., 16-33 mm L and 1 spec. in alcohol with body intact, Bahía Willard, alive under rocks, Apr. 1967
SDNHM 86823, 1 v., 9 mm L, Puertecitos, in drift
Remarks: *Promantellum* Iredale, 1939, has flattened, widely gaping valves at the posterior side for less than half its length and is free swimming.
Distribution: Northern end of the Gulf to Peru (Keen, 1971); Puertecitos (DuShane, 1962); 5S-31N (Bernard, 1983)

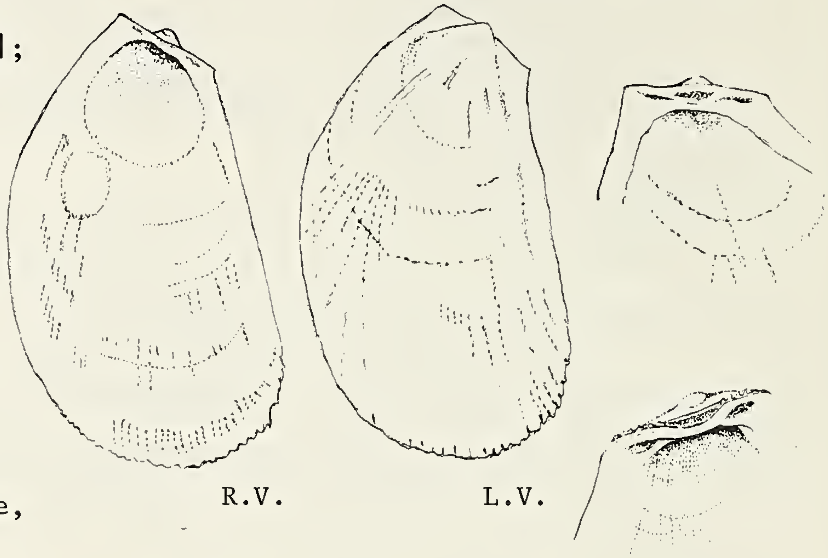


Figure 21. *Lima (Promantellum) pacifica* Orbigny, 1846, Gemmell specimen (SDNHM 86822), 15.1 mm L, interior (R.V.), exterior (L.V.)

Lima (Limaria) orbignyi (Lamy, 1930) [Replacement name for *L. angulata* Sowerby, 1843 (not Münster, 1841)]
Jour. de Conchyl. 74(3):180
Figure references: Keen #220 and Gemmell, Myers and Hertz (1981:91, fig. 9)
SDNHM 86824 (ex G-379) 27 spec., 16-27 mm L, Pta. San Felipe and to both the N and S in rocky areas; found alive between and under rocks attached by byssus threads in the form of a nest or cocoon. Seasonal from Jan. to May
SDNHM 86825, (ex G-379A) 2 v., 9.9 and 12 mm L, dredged, Chamizal II, W of N end of El Muerto, 1.6 km (1 mi.) offshore in sand [30°04'30"N: 114°33'42"W] in 10.9-27.4 m, 8-10 July 1969
Remarks: For comparison of this species with *L. hemphilli* Hertlein and Strong, 1946, see Gemmell, Myers and Hertz (1981)
Distribution: Northern end of the Gulf to Chile (Keen, 1971); 34S-31N (Bernard, 1983)

ANOMIIDAE

Anomia peruviana Orbigny, 1846
Voy. Amer. Merid. 5(3):673 [Fig'd Keen (1966, pl. 1, fig. 19a-d)]
Synonyms: *A. adamas, A. alectus, A. hamillus, A. lampe, A. larbas, A. pacilus* all of Gray, 1850; *Calyptraea aberrans* C.B. Adams, 1852
Figure reference: Keen #223
SDNHM 86826, 21 upper valves, 25-76 mm L, El Paraíso, intertidal on tide flats and in drift
Remarks: Although Keen (1971) and Bernard (1983) consider *A. adamas* a valid species, we are tentatively including *A. adamas* in the synonymy of *A. peruviana,* following Olsson (1961) who noted that the surface sculpture varied among specimens. Study material in the SDNHM labeled *A. adamas*

and *A. peruvianus* varied in exterior sculpture within lots and were indistinguishable in muscle scar pattern.

Distribution: Monterey, California to Peru (Keen, 1971); Puertecitos (DuShane, 1962); Guaymas (DuShane and Poorman, 1967); San Luis Gonzaga (DuShane and Sphon, 1968); 5S-37N (Bernard, 1983)

CRASSATELLIDAE

Eucrassatella gibbosa (Sowerby, 1832)

Proc. Zool. Soc. London for 1832:56 [Fig'd Reeve (1843(1) *Crassatella* pl. 1, fig. 1a,b)]

Synonym: *Crassatellites rudis* Li, 1930

Figure references: Keen #230 and Coan (1984, figs. 6-10) and [Figure 22]

SDNHM 86827, 3 v., 35-45 mm L, San Felipe, 1.6 km (1 mi.) S of Pta Estrella

SDNHM 86828, 3 v., 6-10 mm L, dredged, Chamizal II, W of N end of El Muerto [30°04'30"N; 114°33' 42"W] 1.6 km (1mi.) offshore in sand in 10.9-27.4 m, 8-10 July 1969

Remarks: For full discussion of this species see Coan (1984)

Distribution: The Gulf to Peru (Keen, 1971); Bahía San Juanico, Baja California Sur through the Gulf to Paita, Peru (Coan (1984)

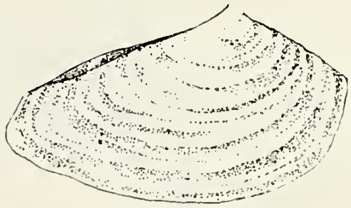


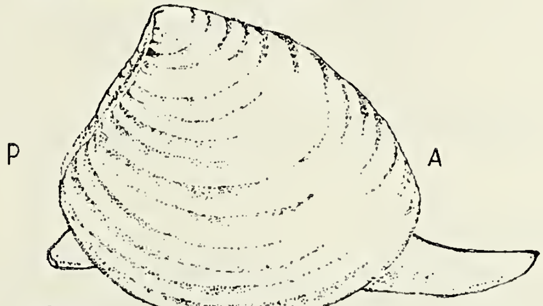
Figure 22. *E. gibbosa* (Sowerby, 1832) Gemmell specimen (SDNHM 86828) 10 mm L, exterior view

Crassinella pacifica (C.B. Adams, 1852)

Ann. Lyceum Nat. Hist. N.Y. 5:499 [Fig'd Turner (1956, pl. 20, figs. 3 and 4)]

Synonym: *Crassinella mexicana* Pilsbry and Lowe, 1932

Figure references: Keen #234 (lectotype), #233 *C. mexicana* (holotype) and [Figures 23,24, 25]



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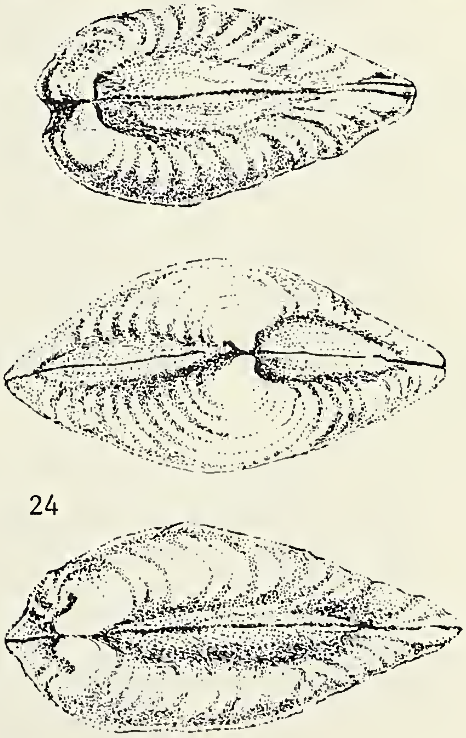

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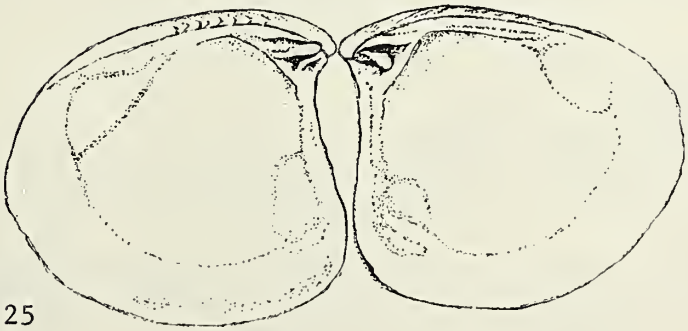

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Figures 23-25. *Crassinella pacifica* (C.B. Adams, 1852). 23) drawing showing orientation of the valves. 24) three views of Gemmell specimen (SDNHM 86829) 3.5 mm L, showing opisthogyrate beaks. 25) interior of specimen shown in Fig. 24

SDNHM 86829, 77 spec., 2-3.5 mm L and 162 v., 1.5-5.0 mm L, San Felipe, from intertidal grunge
SDNHM 86830, 8 spec., and 4 v., 2.0-3.5 mm L, Puertecitos, from intertidal grunge
SDNHM 86831, 5 spec., and 1 v., 1.5-3.0 mm L, Playa Alicia, from intertidal grunge
SDNHM 86832, 1 spec., 2 mm L, Bahía Willard, from intertidal grunge
SDNHM 86833, 1 v., 3.5 mm L, dredged, Chamizal II, W of N end of El Muerto, [30°04'30"N; 114°33'42"W], 1.6 km (1 mi.) offshore in sand in 10.9-27.4 m, 8-10 July 1969
Remarks: We are following Coan (1979) and placing *C. mexicana* in synonymy. There has been much confusion concerning the orientation of the valves of *Crassinella* because the beaks are opisthogyrate (turn posteriorly). For discussion of the orientation of this group see Coan (1979), Allen (1968) and Harry (1966). See Figures 23-25 herein.
Distribution: Crescent Bay and Laguna Beach, California to and through the Gulf and S to Zorritos, Tumbez Prov., Peru (Coan, 1979); 4S-34N (Bernard, 1983)

CARDITIDAE

Carditamera affinis (Sowerby, 1833)
Proc. Zool. Soc. London for 1832:195 [Fig'd Reeve (1843(1) *Cardita* pl. 1, fig. 6)]
Synonym: *Cardita californica* Deshayes, 1854
Figure references: Keen #237 (spiny form) and #237a (smooth form)
SDNHM 86834, 7 spec., 24-84 mm L, Bahía San Felipe, alive among rocks on S side of Pta. San Felipe
Remarks: Six specimens in this lot are the smooth form and one specimen is the spiny form. *Carditamera* Conrad, 1838 = *Byssomera* Olsson, 1961 [Chavan (1969), Abbott (1974)]
Distribution: Northern Gulf to Peru (Keen, 1971); 4S-29N (Bernard, 1983)

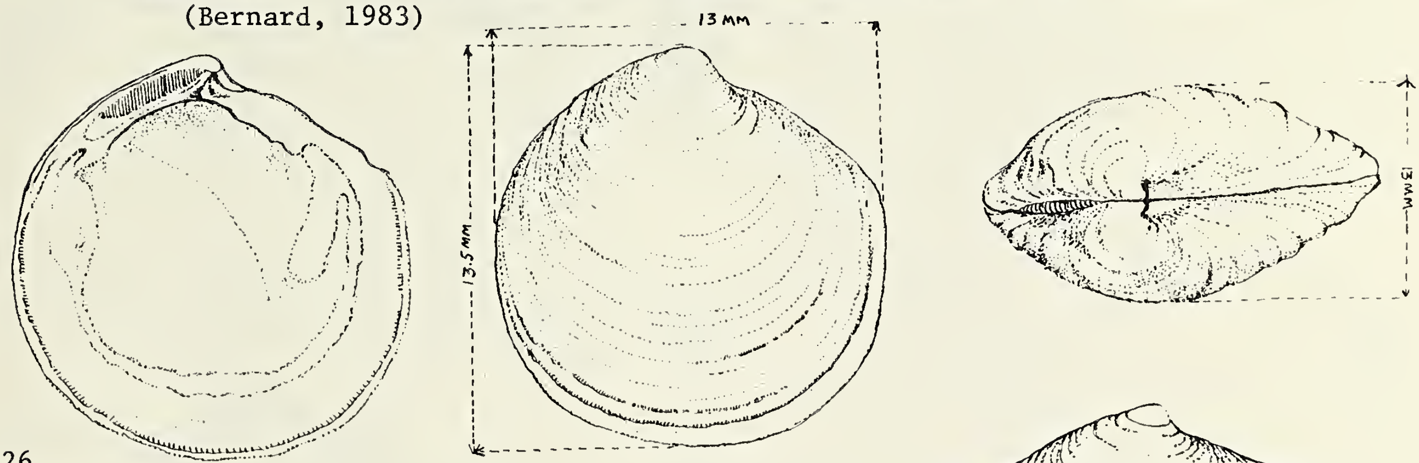
Cardites crassicostata (Sowerby, 1825)
Cat. Shells Coll. late Earl of Tankerville:17
Synonyms: *Cardita cuvieri* Broderip, 1832; *C. michelini* Valenciennes, 1846; *C. sulcosa* Dall, 1903
Figure reference: Keen #239
SDNHM 86835, 2 v., 40-51 mm L, Bahía Willard.
Remarks: Specimens were observed living between rocks on Isla Willard
Distribution: The Gulf to Peru (Keen, 1971); San Luis Gonzaga (DuShane and Sphon, 1968); 2S-27N (Bernard, 1983)

LUCINIDAE

Lucina (Cavalinga) lampra (Dall, 1901)
Proc. USNM 1901:827, pl. 39, fig. 9
Figure references: Keen #268 and [Figures 26-28]
SDNHM 86836, 5 spec., 16-22 mm L and 2 v., 18.6-20.6 mm L, San Felipe, dead
SDNHM 86837, 7 spec. and 1 v., 15-21 mm L, S of San Felipe to San Luis Gonzaga, collected dead
SDNHM 86838, 2 spec., 3.5 and 8 mm L and 6 v., 1.3-8 mm L, dredged, Chamizal II, [29°57'48"N; 114°28'00"W], W of Isla Salvatierra, 0.8 km (0.5 mi.) offshore in sand and pumice and SW face of El Muerto in sand, 31 m offshore [30°04'48"N; 114°32'30"W], in 18-25 m, 8-10 July 1969
Remarks: We have placed this species in *Cavalinga* Chavan, 1937, following Olsson (1961) and Bretsky (1976). Bretsky stated that it "differs from *Callucina* Dall, 1901, in presence of lateral teeth...in lack of radial sculpture and in more consistent development of growth rings." The

Gemmell specimens have the lateral teeth, no radial sculpture and prominent growth rings. We have examined the type lot of 3 specimens of *L. (C.) lampra* (USNM 41626) (Figure 26, fig'd type). We also studied a lot of *L. (C.) lingualis* Carpenter, 1864 from the Field Mus. Nat. Hist. 7098 (Figure 28). Palmer (1958:131) stated that this material is "a first set of duplicates of the Philip Carpenter collection of shells" purchased from the Redpath Museum. We find that *L. (C.) lampra* and *L. (C.) lingualis* are very closely related, as noted by Bretsky (1976). We are using the name *L. (C.) lampra* for the Gemmell specimens.

Distribution: The Gulf to Santa Cruz Bay, Mexico (Keen, 1971); 16N-31N (Bernard, 1983)



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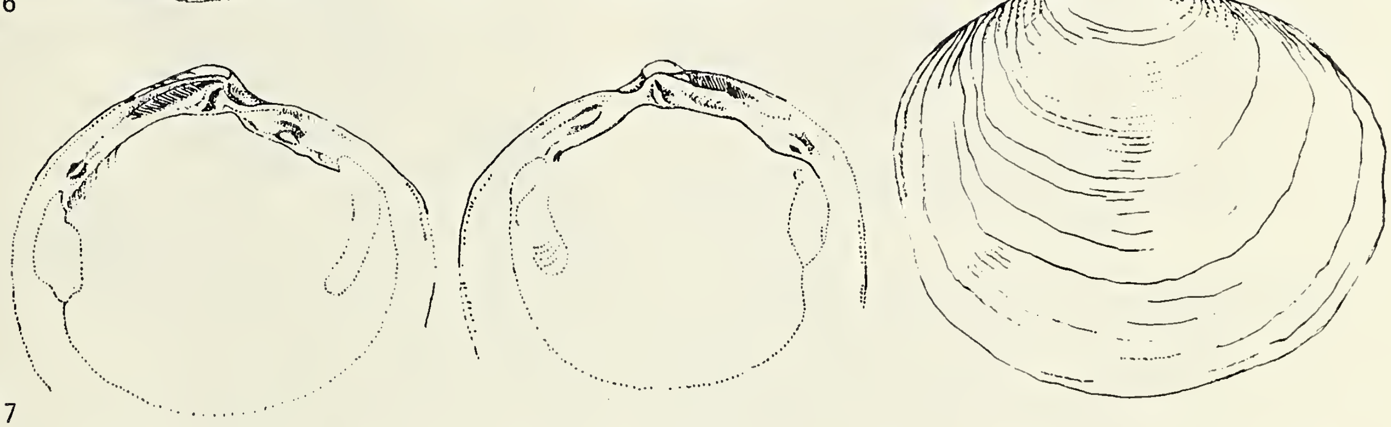

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Figures 26 and 27. *Lucina (Cavalinga) lampra* (Dall, 1901). 26) Figured type (USNM 41626), 13.5 x 13 mm. Type locality: La Paz. 27) Gemmell specimen (SDNHM 86836) 16.2 mm L

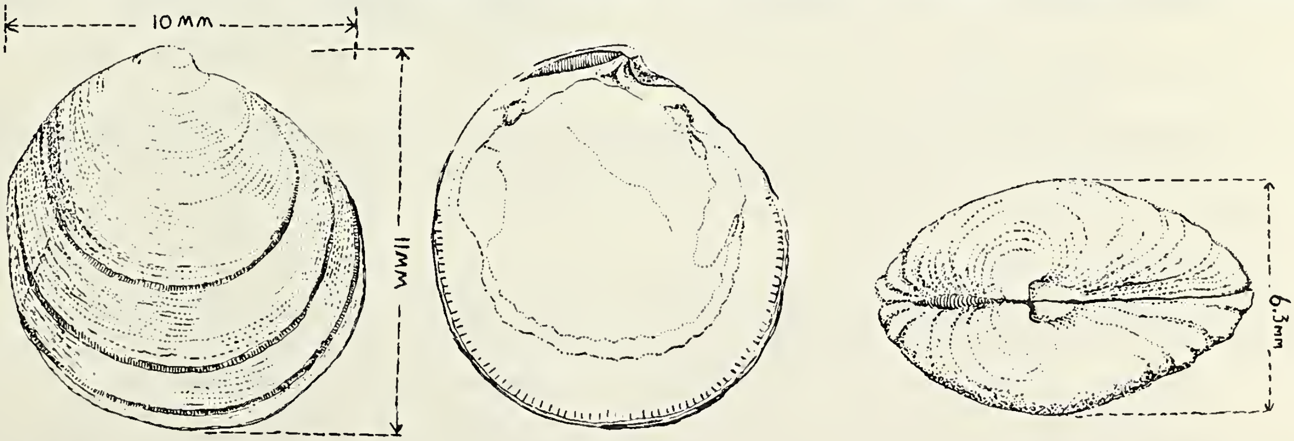


Figure 28. *Lucina (Cavalinga) lingualis* (Carpenter, 1864), (Field Mus. (N.H.) 7098), 11 x 10 mm, three views. Locality: Cabo San Lucas, Baja California Sur, Mexico

Lucina (Here) excavata Carpenter, 1857
Cat. Coll. Mazatlan Shells in Brit. Mus.:98
[Fig'd Brann (1966, pl. 12, fig. 140)]
Figure references: Keen #271 (holotype) and [Figure 29]
SDNHM 86839, 2 v., 6-8 mm L, Playa Alicia, in grunge
SDNHM 86840, 1 spec., 4 mm L, Bahía Willard, in grunge
Remarks: Bernard (1983) raised *Here* Gabb, 1866 to generic level. We retain it as a subgenus.
Distribution: The Gulf to Mazatlán (Keen, 1971); 23N-25N (Bernard, 1983)

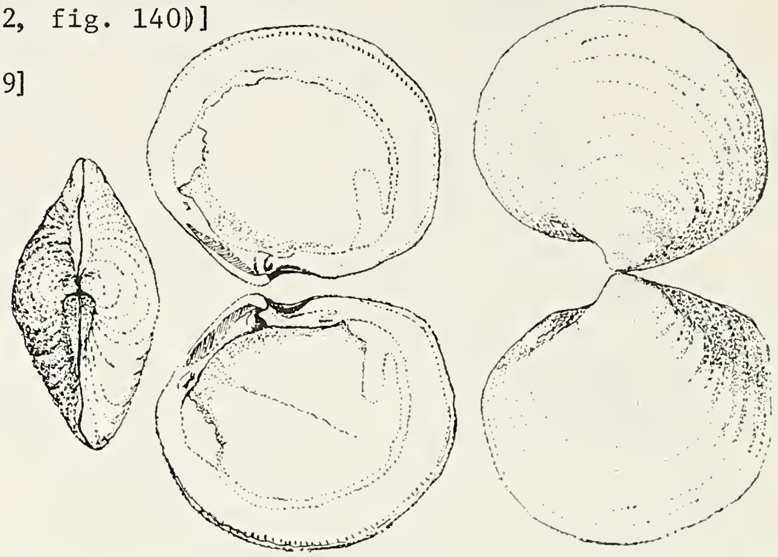


Figure 29. *Lucina (Here) excavata* Carpenter, 1857 Gemmell specimen (SDNHM 86840), 5 mm L, three views.

Lucina (Parvilucina) mazatlanica Carpenter, 1857
Cat. Coll. Mazatlan Shells in Brit. Mus.:99
[Fig'd Brann (1966, pl. 12, fig. 144)]
Figure references: Keen #275 and [Figure 30]
SDNHM 86841, 16 v., 2-5 mm L, dredged, Chamizal II off Isla Salvatierra [29°57'48"N; 114°28'W and 30°04'48"N; 114°32'30"W] in sand in 18-25.6 m, 8-10 July 1969
Distribution: The Gulf to Panama (Keen, 1971); 1S-29N (Bernard, 1983)

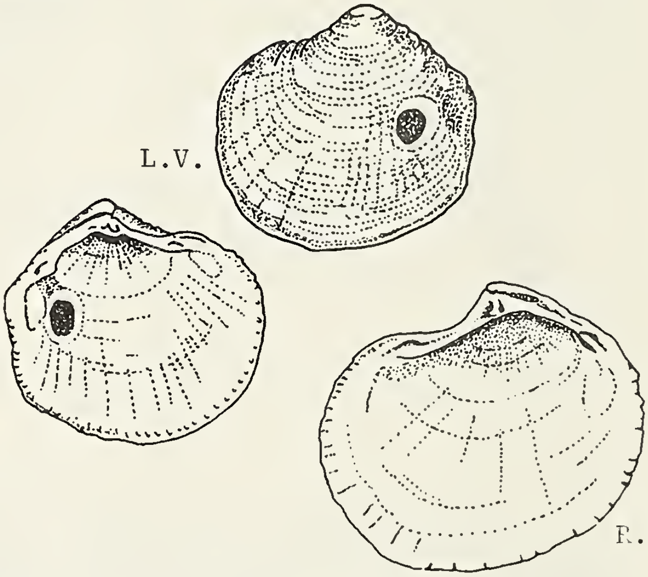


Figure 30. *Lucina (Parvilucina) mazatlanica* Carpenter, 1857, Gemmell valves (SDNHM 86841) left valve (4 mm L); right valve (2 mm L)

*_Codakia distinguenda_ (Tryon, 1872)
Proc. ANSP 1872:130, pl. 6, fig. 3
Synonyms: *Codakia colpoica* Dall, 1901; *C. pinchoti* Pilsbry and Lowe, 1932
Figure reference: Keen #279 [from Dall (1901)]
SDNHM 86842, 4 spec., 45-98 mm L, dead among rocks at Pta. San Felipe and the bay at Puertecitos
Distribution: Baja California to Panama (Keen, 1971); San Luis Gonzaga (DuShane and Sphon, 1968); Guaymas (DuShane and Poorman, 1967); 9N-25N (Bernard, 1983)

Ctena mexicana (Dall, 1901)
Proc. USNM 23:822, pl. 40, fig. 6
Synonyms: *Lucina pectinata* Carpenter, 1857 [not C.B. Adams, 1852]; *L. fibula* Reeve, 1850
Figure references: Keen #284 [type of *L. pectinata*] and [Figure 31]
SDNHM 86843, 2 spec., 12 and 17.2 mm L and 5 v., 5.0-19.4 mm L, Puertecitos, in drift
SDNHM 86844, 6 v., 8-14 mm L, dredged, Chamizal II, in Bahía Gonzaga, S of Isla Willard [29°47'18"N; 114°22'42"W] 90 m offshore in fine sand in 9 m

Distribution: The Gulf to Ecuador (Keen, 1971); 1N-31N (Bernard, 1983)

Divalinga eburnea (Reeve, 1850)

Conch. Icon., 6 *Lucina* pl. 8, fig. 49

Synonyms: *Divaricella lucasana* Dall and Ochsner, 1928
D. columbiensis Lamy, 1934

Figure references: Keen #285 and Gemmell, Myers, Hertz (1981, figs. 1,2)

SDNHM 86845, 8 v., 15-19 mm L, San Luis Gonzaga, in drift

Remarks: For a comparison of this species with *Divalinga dentata* (Wood, 1815), see Gemmell, Myers and Hertz (1981)

Distribution: Bahía Magdalena to Peru (Keen, 1971); 5S-25N (Bernard, 1983)

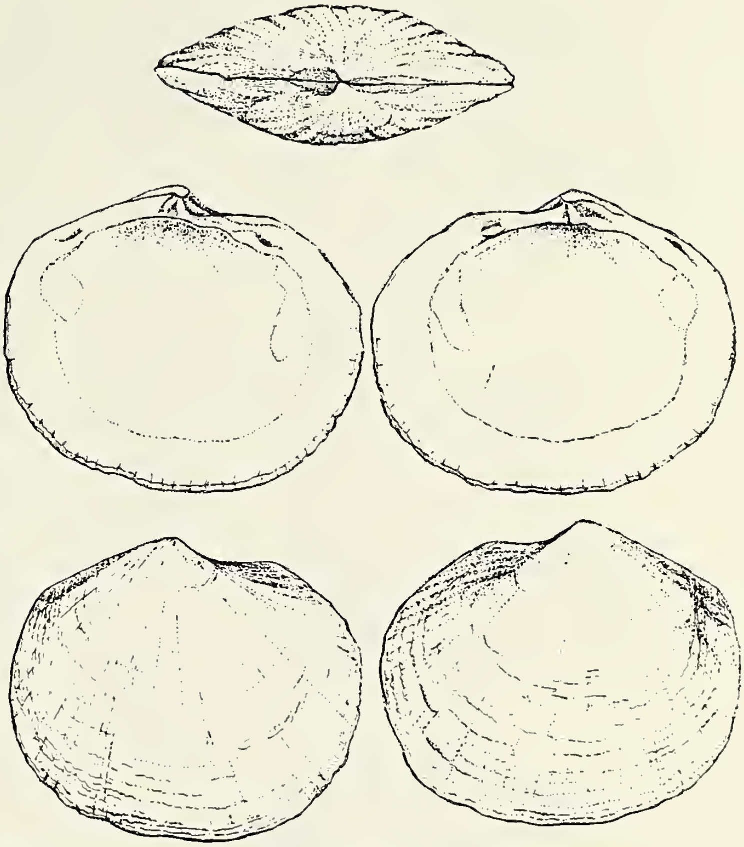


Figure 31. *Ctena mexicana* (Dall, 1901), Gemmell specimen (SDNHM 86843), 12 mm L

UNGULINIDAE

***Diplodonta inezensis* (Hertlein and Strong, 1947)

Zoologica 31(10):130, pl. 1, figs. 1,4

Figure reference: Keen #291

SDNHM 86846, 1 spec., 88 mm L, found in incrusting coralline algae at Radar Beach, Jan. 1968

SDNHM 86847, 2 spec., 7 mm L, dredged, Chamizal II, between Puertecitos and San Luis Gonzaga [30°04'30"N; 114°33'42"W] 1.6 km (1 mi.) offshore in 10-27.4 m on sand, 8-10 July 1969

Distribution: Bahía Santa Inez to Isla Perlas, Panama, offshore (Keen, 1971); Puertecitos (DuShane, 1962); 9N-27N (Bernard, 1983)

Diplodonta orbellus (Gould, 1851)

Proc. Boston Soc. Nat. Hist. 4:90 [Fig'd Gould (1853:6, pl. 15, fig. 3)]

Figure reference: Hertz, Myers and Gemmell (1982, figs. 1-7) [unfigured in Keen (1971)]

SDNHM 86848, 4 spec., 16-20 mm L, San Luis Gonzaga, alive under rocks in mud casts

SDNHM 86849, 3 spec. and 4 v., 6-11 mm L, dredged, Chamizal II [30°04'30"N; 114°33'42"W] 1.6 km (1 mi.) offshore in sand in 11-27.4 m, 8-10 July 1969

SDNHM 86850, 2 spec., 19 and 20 mm L, Pta. San Felipe, alive, under rocks, Apr. 1969

SDNHM 86851, 6 v., 7-16 mm L, Playa Alicia, on minus tide, 25 Apr. 1982

Remarks: For discussion of this species see Hertz, Myers and Gemmell (1982).

Distribution: Monterey, California, to Panama and throughout the Gulf (Hertz, Myers and Gemmell, 1982)

Diplodonta subquadrata (Carpenter, 1856a)

Proc. Zool. Soc. London for 1855:230 [Fig'd Keen (1968, pl. 56, fig. 26a,b)]

Figure references: Keen #292 and Hertz, Myers and Gemmell (1982, figs. 8-13)

Synonym: *Diplodonta suprema* Olsson, 1961

SDNHM 86852, 1 v., 9.5 mm L, San Luis Gonzaga

Remarks: For discussion of this species, see Hertz, Myers and Gemmell (1982: 76-87)

Distribution: Isla San Benito on the Pacific coast to Panama, Ecuador and the Galapagos and throughout the Gulf (Hertz, Myers and Gemmell, 1982)

Felaniella parilis (Conrad, 1848)

Amer. Jour. Sci. 2nd ser. 5(15):432, fig. 7

Synonyms: *Lucina cornea, L. nitens, L. sericata, L. tellinoides* all of Reeve, 1850; *Diplodonta artemidis* Dall, 1909; *D. serricata* of authors

Figure references: Keen #295 and [Figure 32]

SDNHM 86853, 2 v., and 1 broken v., 4.3-6 mm L, Playa Alicia, in grunge

SDNHM 86854, 7 spec., 7-23 mm L and 3 v., 11.2-23.1 mm L, intertidal on sand bars Bahía San Felipe, living

Remarks: These are often found on the beach drilled by *Polinices* and in drift after storms. According to Bernard (1983), study of a large group of living and fossil material from California and Washington proved that *F. sericata* is conspecific with *F. parilis.*

Distribution: Monterey, California, to Peru for *F. sericata* (Reeve) (Keen, 1971); 4S-37N (Bernard, 1983)

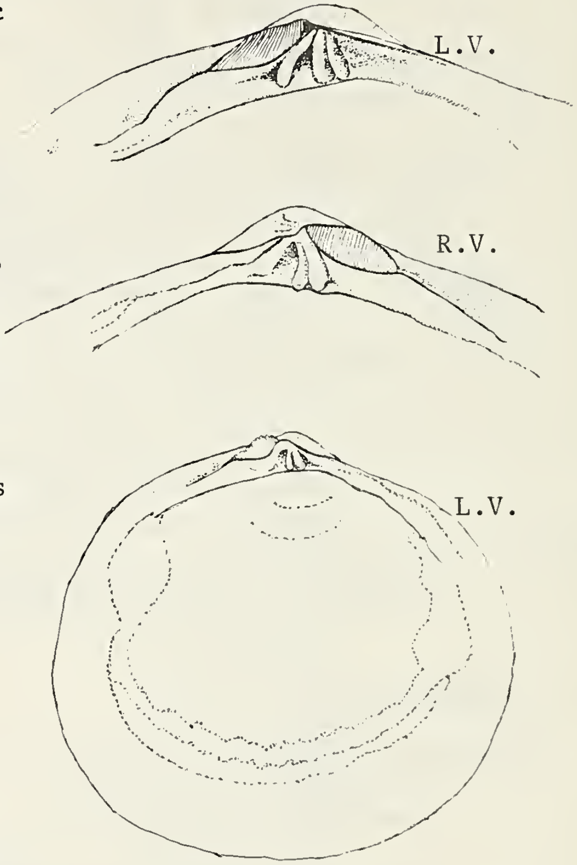


Figure 32. *Felaniella parilis* (Conrad, 1848), Gemmell specimen (SDNHM 86854), 8 mm L, interior and ligamental area

Phlyctiderma discrepans (Carpenter, 1857)

Cat. Coll. Mazatlan Shells in Brit. Mus.: 103 [Fig'd Brann (1966, pl. 12, fig. 150b)]

Synonym: *Diplodonta semirugosa* Dall, 1899a

Figure references: Keen #296 and [Figure 33, detail of hinge]

SDNHM 86855, 1 spec., 9.5 mm L and 1 v., 11.5 mm L, alive on coralline algae washed in at Radar Beach, 10 Jan 1968

Remarks: We are following Keen (1971) in calling this species *P. discrepans* since *P. semiaspera* (Philippi, 1836) is an Atlantic species. For a discussion of the Carpenter figures of *P. discrepans* see Keen (1968).

Distribution: The Gulf to Panama offshore (Keen, 1971); 7N-25N (Bernard, 1983)

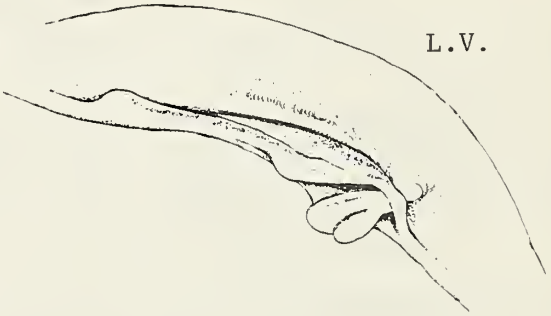


Figure 33. *Phlyctiderma discrepans* (Carpenter, 1857) ligamental groove of Gemmell specimen (SDNHM 86855), 11.5 mm L

GALEOMMATIDAE

Tryphomyax mexicanus (Berry, 1959)

Leaf. in Malac. 1(18):108 [Fig'd Keen (1971, fig. 308) and C.M. Hertz (1984, fig. 35)]

Synonyms: *Tryphomyax lepidoformis, T. lepidoformis laevis* both of Olsson, 1961

Figure references: Keen #307, 308 and [Figure 34]

SDNHM 86856, 1 v. (broken), Playa Alicia, in grunge at low tide

SDNHM 86857, 1 v., 6.5 mm L, San Luis Gonzaga, in dredged material

Remarks: Comparison of type material of *T. mexicanus* with specimens collected at Isla San Francisco off La Paz (SDNHM 51511), and the Gemmell material showed them to be conspecific, thus we are following Bernard (1983) in placing *T. lepidoformis* and *T. lepidoformis laevis* in synonymy.
Distribution: 9N-31N (Bernard, 1983)

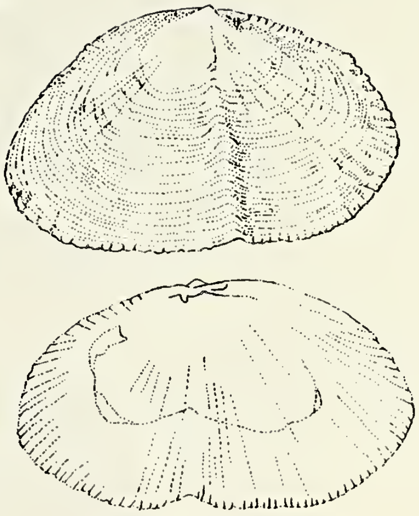


Figure 34. *T. mexicanus* (Berry, 1959), Gemmell specimen (SDNHM 86857) 6.5 mm L, interior and exterior of right valve

KELLIIDAE

Kellia suborbicularis (Montagu, 1803)
Test. Britan.:39
Synonym: *Kellia laperousii* (Deshayes, 1839)
Figure reference: Keen #312
SDNHM 86858, 8 spec. and 1 v., 5.4-6.7 mm L, Playa Alica, in intertidal grunge
SDNHM 86859, 1 v., 9 mm L, S of Pta. Estrella, in drift
Distribution: British Columbia to Peru (Keen, 1971); 4S-60N (Bernard, 1983)

Bornia chiclaya Olsson, 1961
Moll. Trop. E. Pac.:233, pl. 35, fig. 13
Figure references: Keen #313, C.M. Hertz, ed. (1976, 2 figs.) and [Figure 35]
SDNHM 86860, 9 spec. and 4 v., 2.6-8.6 mm L, Bahía San Felipe, after big storm, 1967
SDNHM 86861, 5 spec. and 4 v., 3.2-8.4 mm L, N of Pta. San Felipe near El Paraíso
Remarks: See C.M. Hertz (1976:11)
Distribution: Northwestern Peru (Keen, 1971); 5S (Bernard, 1983); San Felipe (C.M. Hertz, 1976)

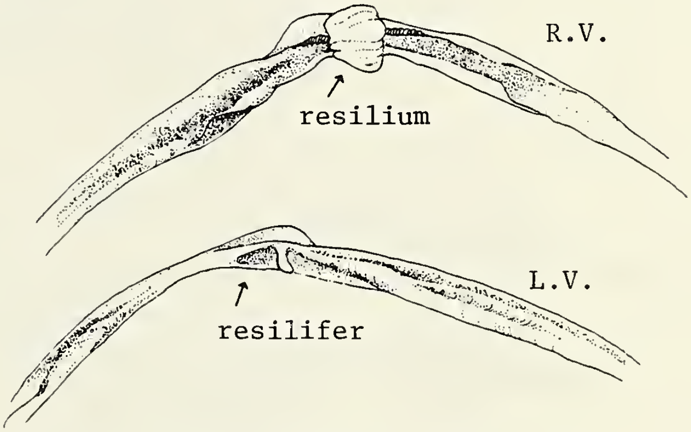


Figure 35. *Bornia chiclaya* Olsson, 1961 Gemmell specimen (SDNHM 86860), 6.5 mm L. Detail of ligamental area

LEPTONIIDAE

***Lepton lediforme* Olsson, 1961
Moll. Trop. E. Pac.:20, pl. 36, fig. 10
Figure references: Keen #321 and [Figure 36]
SDNHM 86862, 1 v., 3mm L, Playa Alicia, in intertidal grunge, Mar. 1976
Distribution: Panama (Keen, 1971); 8N (Bernard, 1983)

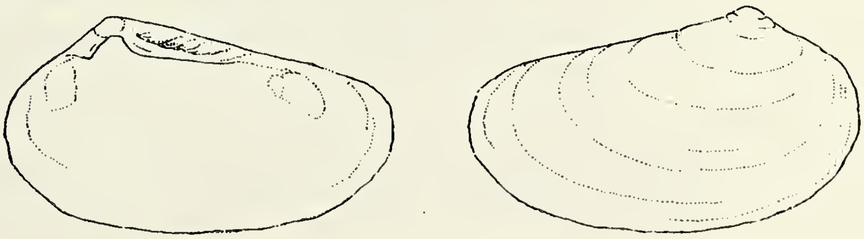


Figure 36. *Lepton lediforme* Olsson, 1961. Gemmell specimen (SDNHM 86862), valve 3 mm L, interior and exterior views of left valve

Solecardia eburnea Conrad, 1849
Proc. ANSP 4:155
Figure references: Keen #322, Gemmell, Myers and Hertz (1981, figs. 5,7) and [Figure 37]

SDNHM 86863, 23 v., 11.5-26 mm L, San Luis Gonzaga, intertidal, Apr. 1967
SDNHM 86864, 1 spec., 17.5 mm L and 1 v., 19.3 mm L, Twenty-eight Miles South Beach, 9.7 km (6 mi) S of Sulphur Mine, Feb. 1969
Remarks: See Gemmell, Myers and Hertz (1981)
Distribution: Panama to Puerto Peñasco (Keen, 1971); 9N-31N (Bernard, 1983)

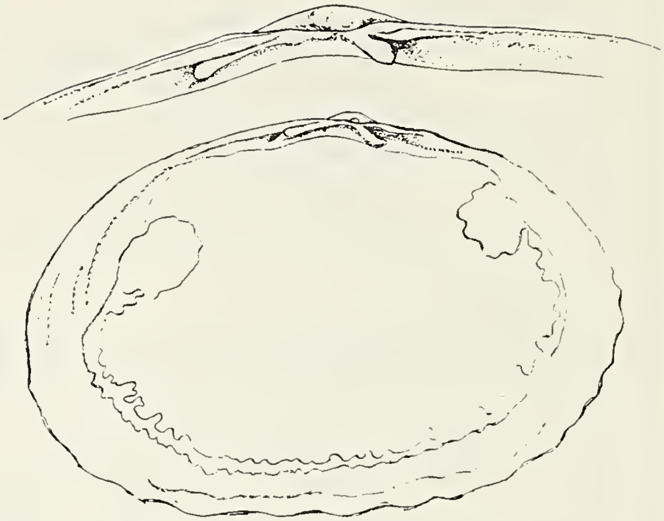


Figure 37. *Solecardia eburnea* Conrad, 1849. Gemmell left valve (SDNHM 86864) 17.5 mm L, interior and detail of hinge

MONTACUTIDAE

Aligena nucea Dall, 1913
Proc. USNM 45(2002):587-597 [Fig'd Dall (1925, pl. 28, fig. 2)]
Figure references: Harry (1969, figs. 21, 22) (holotype) and [Figure 38]
SDNHM 86865, 6 v., 2-4 mm L, Playa Alicia, in grunge, 19 Mar. 1979
Distribution: Puerto Peñasco (Keen, 1971); San Luis Gonzaga (DuShane and Sphon, 1968); 12N-31N (Bernard, 1983) Six- valves in the C. Skoglund collection which we studied were dredged in Panama Bay, extending the southern distribution of this species.

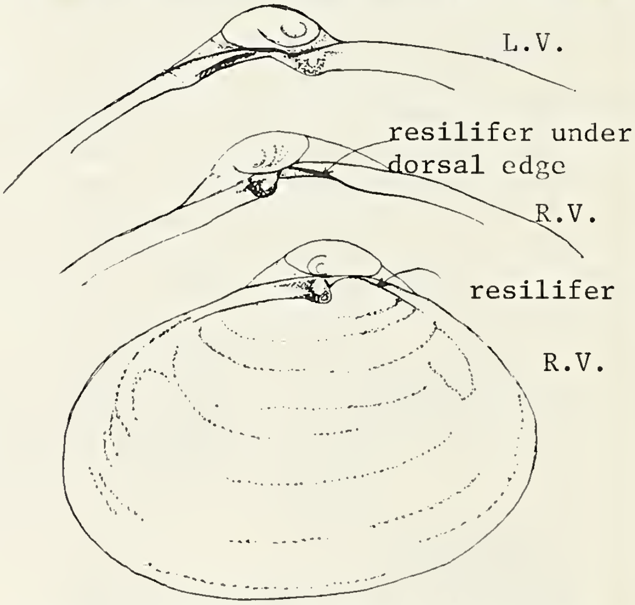


Figure 38. *Aligena nucea* Dall, 1913. Gemmell specimen (SDNHM 86865), 3.2 mm, three views

***Aligena obliqua* Harry, 1969
Veliger 11(3):172-173, figs. 18-20
Figure references: Keen #334 and [Figure 39a]
SDNHM 86867, 6 v., 3.3-5.2 mm L, Playa Alicia, in grunge, intertidally, -6.0 ft. tide, 28 Mar. 1975
SDNHM 86868, 4 v., 3.2-3.4 mm L, Playa Alicia, in grunge, 1969
Remarks: Nine additional valves in the C. Skoglund collection were also examined. Four were dredged in Panama Bay and 5 were collected in Cholla Bay, Puerto Peñasco.
Distribution: Guaymas to Mazatlán (Harry, 1969); Guaymas (Keen, 1971); 23N-28N (Bernard, 1983)

Aligena cf. *obliqua* Harry, 1969
Veliger 11(3):172-173, figs. 18-20
Figure reference: [Figure 39b]
SDNHM 86869, 6 v., 2-3 mm L, Playa Alicia, in grunge at minus tide, 28 Mar. 1975
Remarks: These specimens were collected at the same time as those of *A. obliqua* (SDNHM 86867) in the preceding entry.

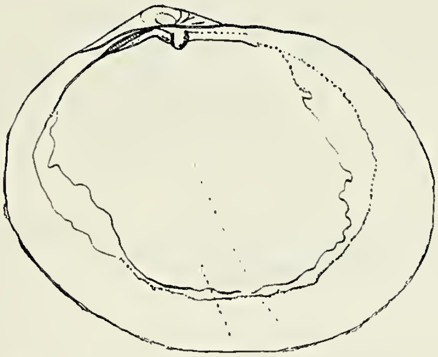


Figure 39 a. *Aligena obliqua* Harry, 1969. Gemmell specimen (SDNHM 86868), 3.4 mm L, interior of left valve

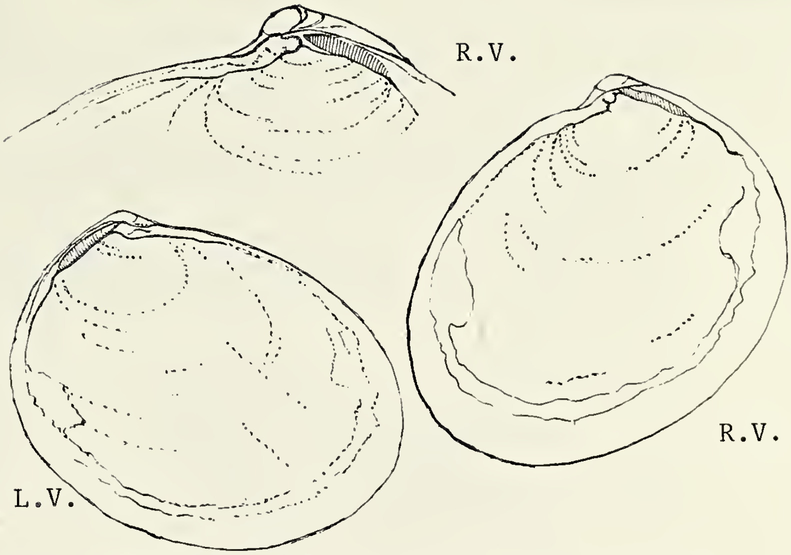


Figure 39b. *Aligena* cf. *obliqua* Harry, 1969 Gemmell specimens (SDNHM 86869), 3 mm L, interior of left and right valves

***Mysella* cf. *grippi* (Dall, 1912)
Nautilus 25:128
Figure reference: [Figure 40a]
SDNHM 86870, 3 v., 5.6, 4.6 and 2·4 mm L and one fragment 2.6 mm L, Playa Alicia, in grunge, Mar. 1976
Remarks: Identification by Paul H. Scott who is working on this group. Scott (*in litt.*) stated that *M. grippi* "is very uncommon in the region ('normal' distribution from southern California to Alaska)."

Mysella sp. C
Figure reference: [Figure 40b]
SDNHM 86866, 1 v., 2.8 mm L, Playa Alicia, in same lot of grunge with SDNHM 86870
Remarks: Scott (*in litt.*) has this specimen under study and the taxon is not yet determined.

***Pythinella sublaevis* (Carpenter, 1857)
Cat. Coll. Mazatlan Shells in Brit. Mus. p. 112 [Fig'd Brann (1966, pl. 14, fig. 160)]
Figure references: Keen #340 and [Figure 41]
SDNHM 86871, 1 spec. and 1 v., each 2 mm L, Playa Alicia, in intertidal grunge, Mar. 1976
Distribution: Mazatlan to Panama (Keen, 1971); 8N-23N (Bernard, 1983)

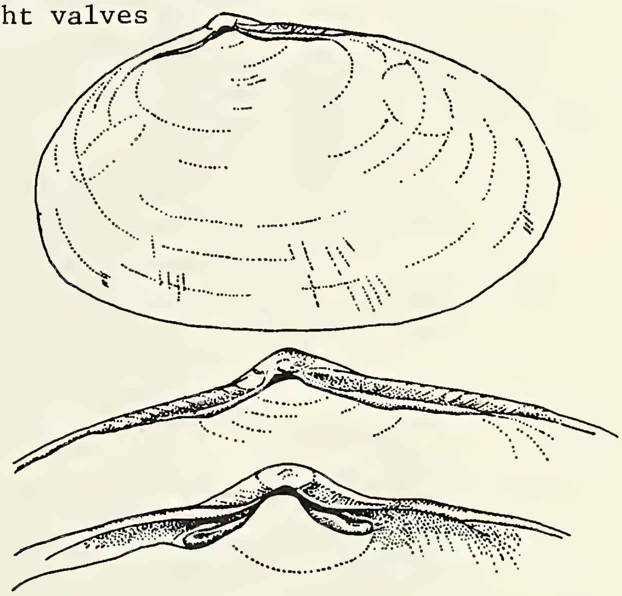
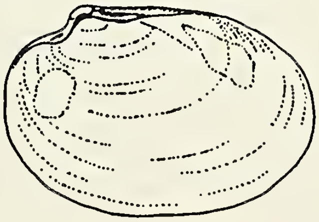


Figure 40a. *Mysella* cf. *grippi* (Dall, 1912), Gemmell specimen (SDNHM 86870), 5.6 mm L,



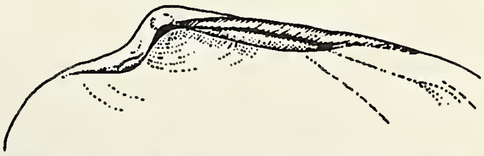


Figure 40b. *Mysella* sp. C, 2.8 mm L Gemmell specimen (SDNHM 86866), 2.8 mm L

SPORTELLIDAE

Ensitellops hertleini Emerson and Puffer, 1957.
Amer. Mus. Novitates #1825:21, fig. 2
Figure references: Keen #344 and [Figure 42]
SDNHM 86872, 3 v., 3-8 mm L, Playa Alicia, 20 Apr. 1975
SDNHM 86873, 2 v., 4-5 mm L, Campo Uno
SDNHM 86874, 3 v., (one broken) 4-5 mm L, Playa Alicia, in intertidal grunge, between rocks, Mar. 1976
Distribution: San Felipe to Ecuador (Keen, 1971); 2S-31N (Bernard, 1983)

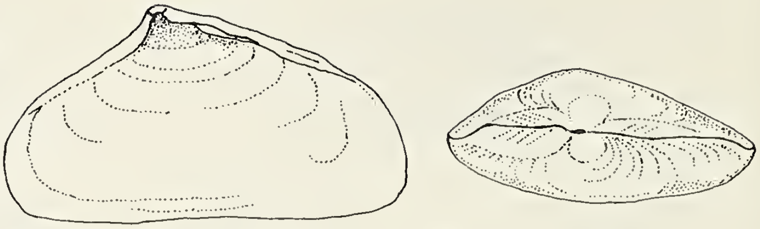


Figure 41. *Pythinella sublaevis* (Carpenter, 1857) Gemmell specimen (SDNHM 86871), 2 mm L, exterior and interior of left valve

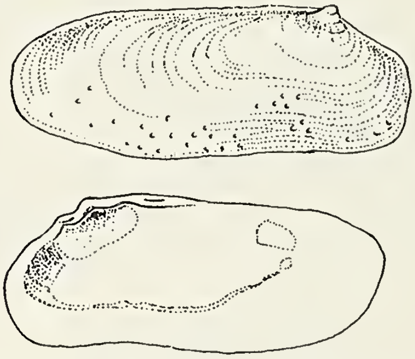


Figure 42. *Ensitellops hertleini* Emerson and Puffer, 1957. Gemmell specimen (SDNHM 86872), 5 mm L, right valve

CHAMIDAE

Chama buddiana C.B. Adams, 1852
Ann. Lyceum Nat. Hist. N.Y. 5:477 [Fig'd Turner 1956, pl. 20, figs. 7,8)]
Synonyms: *Chama ?frondosa* var. *fornicata* Carpenter, 1857; *C. mexicana* of authors [not *C. frondosa mexicana* Carpenter, 1857]
Figure references: Hertz, Gemmell and Myers (1982, figs. 2,3) [See cover herein]
SDNHM 86875, 11 spec. and 1 v., 21.2-90 mm L, Bahía Willard, living on rocks at low and minus tides, Apr. 1966 and Apr. 1967
Remarks: For discussion of this species see Hertz, Gemmell and Myers (1982).
Distribution: San Felipe to Galapagos Is. (Hertz, Gemmell and Myers, 1982)

** *Chama frondosa* Broderip, 1835a
Proc. Zool. Soc. London for 1834:148
Figure reference: Keen #348
SDNHM 86876, 3 v., 25-40 mm L, S of San Felipe at Percebu, in beach drift among rocks at low tide, 1964
Remarks: *C. frondosa* var. *mexicana* Carpenter, 1857 is a synonym of *C. echinata* Broderip, 1835a (Hertz, Gemmell and Myers, 1982).
Distribution: La Paz to Ecuador (Keen, 1971); 2N-24N (Bernard, 1983)

Pseudochama saavedrai Hertlein and Strong, 1946
Zoologica 31(8):110, pl. 1, figs. 1,3,8,10
Figure reference: Keen #359 [from Hertlein and Strong, 1946]
SDNHM 86877, 10 spec., 20-50 mm L, Bahía Willard, attached to stones, 20 Apr. 1966
Distribution: Head of the Gulf to Manzanillo (Keen, 1971); 8N-31N (Bernard, 1983).

CARDIIDAE

Trachycardium senticosum (Sowerby, 1833)
Proc. Zool. Soc. London for 1833:84 [Fig'd Reeve (1844(2) *Cardium*, pl. 16, fig. 82 as *C. rastrum*)]
Synonym: *Cardium rastrum* Reeve, 1845
Figure reference: Keen #362
SDNHM 86878, 53 spec. and 1 v., 14-33 mm L, Bahía San Felipe to Playa Alicia, on muddy sand bars and reefs

Distribution: The Gulf to Paita, Peru (Keen, 1971); 5S-24N (Bernard, 1983)

Trachycardium panamense (Sowerby, 1833)
Proc. Zool. Soc. London: 85 [Fig'd Reeve (1844(2) *Cardium*, pl. 11 fig. 56)]
Figure reference: Keen #363
SDNHM 86879, 4 spec. and 1 v., 12-65 mm L, Bahía San Felipe, on sand bars
SDNHM 90110, 2 v., 2 mm L, Chamizal II, dredged W of N end of El Muerto, [30°04'30"N; 114°33'42"W] 1.6 km (1 mi.) offshore in 36 to 90 m, in sand, 8-10 July 1969
Distribution: San Ignacio Lagoon throughout the Gulf to Costa Rica (Keen, 1971); 8N-28N (Bernard, 1983)

Papyridea aspersa (Sowerby, 1833)
Proc. Zool. Soc. London for 1833:85
Figure reference: Keen #366
SDNHM 86880, 10 spec., 22-55 mm L, Bahía San Luis Gonzaga, alive, Apr. 1966
SDNHM 86881, 1 spec., 48 mm L, 48.3 km (30 mi.) S of San Felipe
Distribution: Manuela Lagoon, Baja California, and the Gulf to Peru (Keen, 1971); 5S-31N (Bernard, 1983)

Trigonicardia granifera (Broderip and Sowerby, 1829)
Zool. Jour. London 4:367 [Fig'd Reeve (1844(2) *Cardium*, pl. 8, fig. 43)]
Synonym: *Cardium alabastrum* Carpenter, 1857
Figure references: Keen #369 and Gemmell, Hertz and Myers (1980:31, fig. 6)
SDNHM 86882, 7 spec., 4.5-10 mm L and 9 v., 2.0-10.0 mm L, Campo Uno, alive in mud
SDNHM 86883, (ex G-405S), 7 spec., 2.0-11.0 mm L, dredged Chamizal I, [30°41'N to 30°51'12"N; 114°32'W to 114°41'W] from Pta. Estrella S 35.4 km (22 mi.) approx. 4.8 km (3 mi.) offshore in 9.1-18.3 m, 27 June 1968
Remarks: On uneroded specimens, the nodes on the ribs have a sawtoothed appearance (Gemmell, Hertz and Myers (1980:31)
Distribution: Bahía Magdalena, through the Gulf to Peru (Keen, 1971); 4S-30N (Bernard, 1983)

Americardia biangulata (Broderip and Sowerby, 1829)
Zool. Jour. London 4:367
Synonym: *Cardium magnificum* (Carpenter, 1857)
Figure reference: Keen #370
SDNHM 86884, 6 spec. and 2 v., 25-29 mm L, San Luis Gonzaga, in drift
SDNHM 86885, 9 v., 5-10 mm L, Playa Alicia, in intertidal grunge
SDNHM 86886, 16 spec., 9-25 mm L, Playa Alicia, in muddy depressions at -6 ft. (-1.8 m) low tide. In April 1975, after gale winds the surface dried out quickly and specimens popped to the surface.
Distribution: Southern California to Guayaquil, Ecuador (Keen, 1971); 3S-34N (Bernard, 1983)

Laevicardium elatum (Sowerby, 1833)
Proc. Zool. Soc. London for 1833:84 [Fig'd Reeve (1844(2) *Cardium*, pl. 8, fig 4)]
Figure reference: Keen #378
SDNHM 86887, 13 spec., 20-130 mm L, Bahía San Felipe, alive during winter minus tides
Distribution: Southern California through the Gulf to Panama (Keen, 1971); 16N-34N (Bernard, 1983)

Laevicardium elenense (Sowerby, 1840)
Conch. Illus. (*Cardium*) fig. 58
Synonym: *Cardium apicinum* Carpenter, 1864a
Figure references: Keen #379 and Olsson (1961, pl. 38, figs. 2, 2a)
SDNHM 86888, 28 spec., 10-21 mm L, Bahía San Felipe, common at low tide in spring, in mud and sand, Apr. 1967-Jan. 1968
SDNHM 90102, 2 spec., 9-10 mm L, dredged Chamizal II, W of N end of El Muerto, [30°04'30"N;114°33'42"W] 1.6 km (1 mi.) offshore in 36-90 m, in sand, 8-10 July 1969

Remarks: The species was illustrated in 1840 in Conch. Illus. (Reynell, 1910). A written description appeared in 1841 in Proc. Zool. Soc. London for 1840.
Distribution: Bahía Magdalena, through the Gulf to Zorritos, Peru (Keen, 1971); 4S-30N (Bernard, 1983)

VENERIDAE

Tivela byronensis (Gray, 1838)
Analyst 8:304
Synonyms: *Cytherea radiata* Sowerby, 1835 [not Von Mühlfeld, 1811]
Venus solangensis Orbigny, 1845 [new name for *Cytherea radiata* Sowerby]
Figure reference: Keen #385
SDNHM 86889, 11 spec., 11-50 mm L, Bahía San Felipe
SDNHM 86890, 11 v., 2-5 mm L, Playa Alicia, in grunge at minus tides, between rocks
SDNHM 86891 (ex G-411S), 13 spec., 2-12 mm L [as *Tivela argentina* in Gemmell, Hertz and Myers (1980)] dredged Chamizal I, Pta. Estrella , S for 35.4 km [30°41N to 30°51'12"N and 114°32'W to 114°41'W] in 9.1-18.3 m, from seastar stomachs, 27 June 1968
Distribution: Lagoon Head, Baja California, through the Gulf to Ecuador (Keen, 1971); 4S-30N (Bernard, 1983)

Pitar helenae Olsson, 1961
Moll. Trop. E. Pac.:276, pl. 45, figs. 2, 2a
Figure reference: Keen #401
SDNHM 86892, 8 v., 15-25.5 mm L and 2 spec. (collected dead), 14-15 mm L, San Luis Gonzaga, Apr. 1967
SDNHM 86893, 1 spec., 23 mm L, Playa Alicia, living, Mar. 1976
SDNHM 86894, 4 spec., 18-37 mm L, Puertecitos, living, Mar. 1964
Distribution: The Gulf to Panama (Keen, 1971); Consag Rock (DuShane and Brennan, 1969); 8N-26N (Bernard, 1983)

Pitar pollicaris (Carpenter, 1864a)
Ann. Mag. Nat. Hist. ser. 3(13):312
Figure reference: Keen #406
SDNHM 86895, 1 v., 9 mm L (brown), Bahía Willard, 20 Apr. 1967
SDNHM 86896, 1 v., 54 mm L (white), Bahía San Felipe
Distribution: The Gulf (Keen, 1971); 26N-29N (Bernard, 1983)

Pitar concinnus (Sowerby, 1835)
Proc. Zool. Soc. London for 1835:23 [Fig'd Reeve (1863:14 *Dione*, pl. 8, figs. 31a, 31b)]
Figure reference: Keen #413
SDNHM 86897, 12 spec., 10-34 mm L (colors from pure white to banded to solid reddish brown), Bahía San Felipe
SDNHM 86898, 66 v., 2-8 mm L, Playa Alicia, in intertidal grunge
SDNHM 86899 (ex G-416S), 12 spec., 2-6 mm L, dredged Chamizal I, from Pta. Estrella S for 35.4 km (22 mi.) [30°41'N to 30°51'12"N and 114°32'W to 114°41'W] in 9.1-18.3 m, from seastar stomachs, 27 June 1968
Remarks: This species varies from white to reddish brown, some are white with reddish-brown rays; some specimens are more pointed at the posterior end and some have very fine sculpture while others have concentric ribs that are thick and irregular. We have found these forms together in the San Felipe area.
Distribution: Bahía Magdalena, Baja California, through the Gulf to Peru (Keen, 1971); 5S-29N (Bernard, 1983)

Megapitaria squalida (Sowerby, 1835)
Proc. Zool. Soc. London for 1835:23 [Fig'd Reeve (1863:14 *Dione*, pl. 14, fig. 10)]
Figure references: Keen #425, Olsson (1961, pl. 46, figs. 2-2c)

SDNHM 86900, 9 spec., 17-98 mm L, Puertecitos
SDNHM 86901, 3 spec. and 13 v., 6-18 mm L, dredged, Bahía San Luis Gonzaga, 1969
SDNHM 86902 (ex G-417S), 1 spec., 7 mm L, Bahía San Felipe, intertidal, from seastar stomach, -4.0 ft. tide, 18-20 June 1970
Distribution: Scammon's Lagoon, through the Gulf S to Peru (Keen, 1971); 4S-31N (Bernard, 1983)

Dosinia ponderosa (Gray, 1838)
Analyst 1:309
Synonym: *Cytherea (Artemis) gigantea* Philippi, 1847 (ex Sowerby MS)
Figure reference: Keen #427
SDNHM 86903, 1 v., 8 mm L, Chamizal II, W of N end of El Muerto [30°04'30"N; 114°33'42"W]; 1.6 km (1 mi.) offshore in sand in 11-27.4 m, from seastar stomachs, 8-10 July 1969
SDNHM 86904, 11 spec. and 1 v., 25-135 mm L, Puertecitos on sand bars in the bay, Mar. 1964
Distribution: Scammon's Lagoon, through the Gulf and S to Paita, Peru (Keen, 1971); 5S-28N (Bernard, 1983)

Cyclinella singleyi Dall, 1902a
Nautilus 16(4):44 [Fig'd Dall (1902b: 26(1312), pl. 15, fig. 3)]
Figure references: Keen #432 (center drawing from Dall, 1902b) and [Figure 43]
SDNHM 86905, 11 spec. and 2 v., 24-59 mm L, dead on beach at Ensenada Blanca after storms
Distribution: Scammon's Lagoon, through the Gulf and S to Panama (Keen, 1971); 3S-27N (Bernard, 1983)

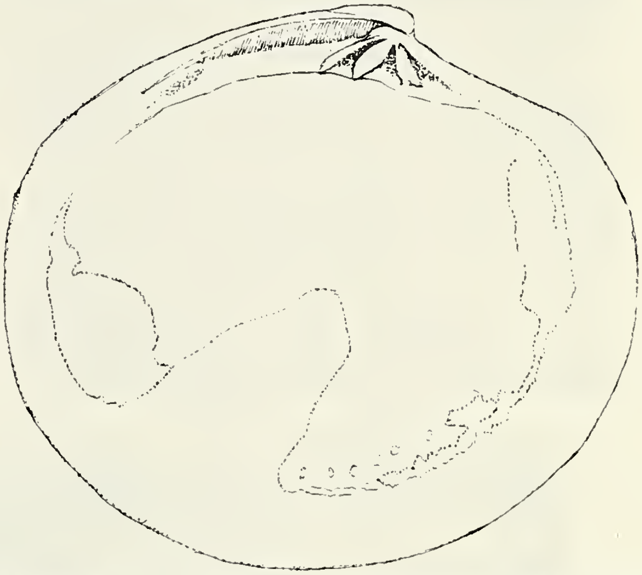


Figure 43. *Cyclinella singleyi* Dall, 1902a Gemmell specimen (SDNHM 86905), 31.5 mm L interior of left valve

Chione californiensis (Broderip, 1835b)
Proc. Zool. Soc. London for 1835:43
Synonyms: *Venus succincta* Valenciennes, 1827 [not Linnaeus, 1767, fide Sherborn (1899); Walker (1928)]
Venus leucodon Sowerby, 1835
Venus nuttalli Conrad, 1837
Chione gealeyi and *C durhami* both of Parker, 1949
Figure reference: Keen #440
SDNHM 86906, 4 spec., 27-59 mm L, Bahía San Felipe, alive on sand bars
Distribution: Pt. Magu, California to Panama (Keen, 1971); 17N-34N (Bernard, 1983)

Chione tumens (Verrill, 1870)
Amer. Jour. Sci. ser. 2, vol. 49(146):122
Figure reference: Keen #444
SDNHM 86907, 7 spec. and 2 v., 22-42 mm L, Bahía Willard, living, Jan. 1964
Distribution: Southern W coast of Baja California, and through the Gulf (Keen, 1971); 27N-28N (Bernard, 1983)

Chione undatella (Sowerby, 1835)
Proc. Zool. Soc. London for 1835:22 Fig'd Reeve (1863, *Venus* pl. 15, sp. 68)
Synonyms: *Venus neglecta* Sowerby, 1835; *V. excavata* Carpenter, 1857; *V. bilineata* Reeve, 1863; *V. simillima* Sowerby, 1853; *Chione undatella taberi* Parker, 1949

Figure reference: Keen #445
SDNHM 86908, 16 spec., 10-45 mm L, Bahía San Felipe and beaches both N and S of the bay, alive on sand bars
Distribution: Southern California to Peru (Keen, 1971); 5S-34N (Bernard, 1983)

Chione cortezi (Carpenter, 1864b, ex Sloat MS)
Rept. Brit. Assoc. Adv. Sci. for 1863:570 [Fig'd Keen (1968, pl. 55, fig. 19)]
Figure references: Keen #446 and [Figures 44,45]
SDNHM 86909, 16 spec., 8-80 mm L, El Paraíso, (large beds from El Paraíso to Estero La Ramada) in mud, alive
Remarks: We call the Gemmell specimens *C. cortezi* because the original figure of *C. fluctifraga* (Sowerby, 1853) reproduced here from Thes. Conchyl. in Figure 44 shows a specimen with a deep sinus. The Gemmell specimens (Figure 45) have a small sinus. Carpenter (1863:570) said *C. cortezi* "is the more rounded and porcellanous from of *V. fluctifraga*...." The Gemmell specimens collected alive are polished exteriorly.
Distribution: Bahia Magdalena to San Felipe and Guaymas (Keen, 1971); 25N-32N (Bernard, 1983)

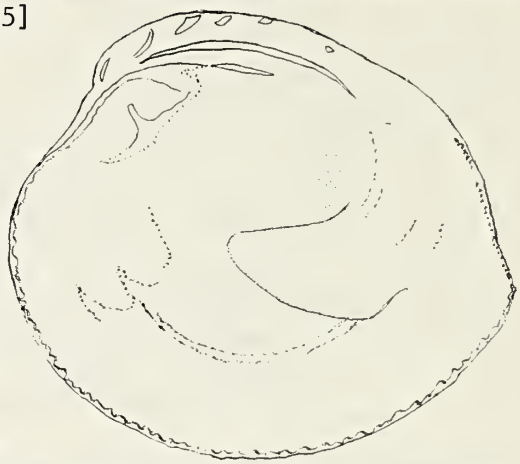


Figure 44. *Chione fluctifraga* (Sowerby, 1853), type traced from microfiche of Sowerby (1853), no size given, interior of right valve. Type loc.: Australia

Chione gnidia (Broderip and Sowerby, 1829)
Zool. Jour. London 4:364 [Fig'd Reeve (1863 (14) *Venus*, pl. 11, sp. 37)]
Figure reference: Keen #450
SDNHM 86910, 13 spec., 18-67 mm L, Bahía San Felipe
SDNHM 86911, 14 spec., 2-14 mm L, from seastar stomachs, off Pta. Estrella
Distribution: Isla Cedros, through the Gulf and S to Paita, Peru (Keen, 1971); 6S-32 N (Bernard, 1983)

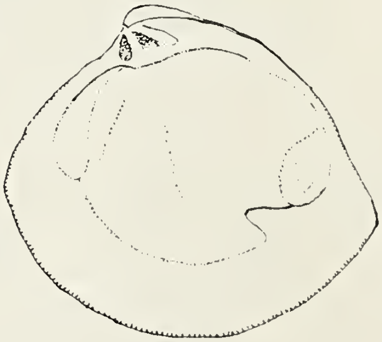


Figure 45. *Chione cortezi* (Carpenter, 1864b ex Sloat MS) Gemmell specimen (SDNHM 86909) 6.7 mm L, interior of right valve

Chione pulicaria (Broderip, 1835b)
Proc. Zool. Soc. London for 1835:44
Figure reference: Keen #455
SDNHM 86912, 6 spec., 45.5-52.0 mm L, Bahía San Felipe on sand bars
SDNHM 86913 (ex G-425S), 3 spec., 3.0-6.0 mm L, Pta. Estrella S for 35.4 km (22 mi.) approx. 4.8 km (3 mi.) offshore [30°41'N to 30°51'12"N and 114°32'W to 114°41'W], dredged from 9.1-18.3 m on sandy bottom, 27 June 1968
Distribution: The Gulf to Tumaco, Colombia (Keen, 1971); 2N-27N (Bernard, 1983)

Chione mariae (Orbigny, 1846)
Moll. In R. Sagra. Hist. phys. polit....l'Ile de Cuba:563 [not seen]
Synonym: *Venus cypria* Sowerby, 1835 [not Brocchi, 1814; not Risso, 1826 fide Bernard (1983)]
Figure reference: Keen #460 [from Lowe (1935)]
SDNHM 86914 (ex G-426S), 2 spec., 2.5 and 7.0 mm L, Pta. Estrella S for 35.4 km (22 mi.), approx. 4.8 km (3 mi.) offshore [30°41'N to 30°51'12"N and 114°32'W to 114°41'W], dredged from 9.1-18.3 m on sandy bottom, 27 June 1968

SDNHM 86915, 36 spec. and 2 v., 5-18 mm L, from intertidal grunge, Playa Alicia, on N side of reef at extreme low tides

Distribution: Isla Cedros, Baja California, through the Gulf to Ecuador (Keen, 1971); 5S-28N (Bernard, 1983)

Chione squamosa (Carpenter, 1857)

Cat. Coll. of Mazatlan Shells in Brit. Mus.:78 [Fig'd Brann (1966, pl. 9 fig. 111)]; Keen (1968, pl. 55, fig. 13a,b lectotype)]

Synonyms: *Venus troglodytes* Mörch, 1861; *Chione picta* Willett, 1944 (ex Dall MS)

Figure references: Keen #463 and [Figures 46, 47, 48]

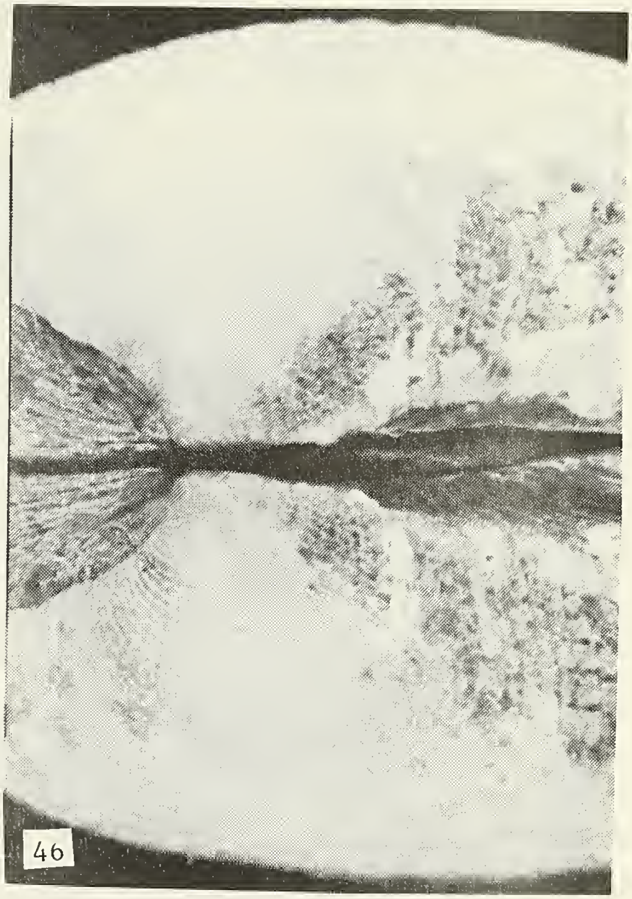
SDNHM 86916, 10 spec., 3-12 mm L, N end of Bahía San Felipe, alive under rocks at low tide

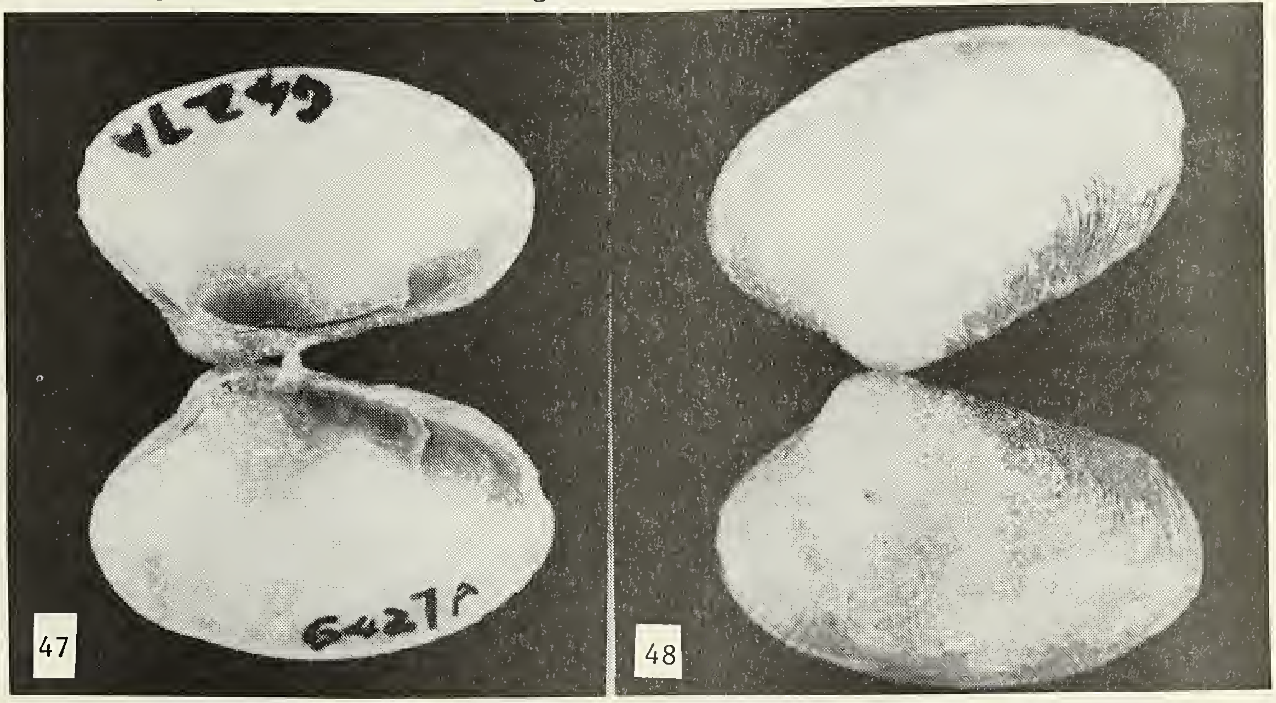
SDNHM 86917, 6 spec., 13-15 mm L, 1.6 km (1 mi.) N of Coloradito, alive under rocks at low tide, Apr. 1969

SDNHM 86918, 2 spec., 5 mm L, N side of Bahía Willard, in drift

SDNHM 86919, 3 spec., 11-12 mm L, Playa Alicia, alive under rocks at low tide, Mar. 1976

Remarks: Though Keen (1971) considered *C. picta* Willett, 1944, (length to 10 mm) a "slightly larger form" of *C. squamosa* (length to 6 mm), the Gemmell specimens attained a length





Figures 46-48. *Chione squamosa* (Carpenter, 1857). Gemmell specimen (SDNHM 86917), 15 mm L. 46) view from beaks 47) interior view 48) exterior view

of 15 mm, larger than that recorded for *C. picta* and *C. squamosa*. Willett (1944:22) quotes Dr. Harald Rehder as having collected Recent specimens of *C. picta* from the Gulf of California, including the head of the Gulf. After examining both Museum and Gemmell specimens, we follow Olsson (1961:309) and place *C. picta* in synonymy.
Distribution: The Gulf S to Peru (Keen, 1971); 5S-29N (Bernard, 1983)

Protothaca grata (Say, 1831)
Amer. Conch., pt. 3, pl. 26
Synonyms: *Venus discors, V. fuscolineata, V. tricolor* all of Sowerby, 1835; *V. pectunculoides* Valenciennes, 1846; *V. muscaria* Reeve, 1863
Figure references: Keen #473 and Olsson (1961, pl. 53, figs. 2-2b, 7)
SDNHM 86920, 20 spec., 4-20 mm L, N of San Felipe to San Luis Gonzaga, under cobbles, intertidally at low tide and among rocks at most arroyos on alluvial fans
Distribution: Cabo Colnett, through the Gulf to Chile (Keen, 1971); 20S-27N (Bernard, 1983)

PETRICOLIDAE

Petricola lucasana Hertlein and Strong, 1948
Zoologica 33(4):194, pl. 2, figs. 4,9
Figure reference: Keen #477
SDNHM 86921, 2 spec., and 1 v., 30-31 mm L, Playa Alicia, alive in mud among rocks
SDNHM 86922, 2 spec., 36 and 38 mm L, San Luis Gonzaga, among rocks in mud nests, Apr. 1967
Distribution: The Gulf from Cabo San Lucas to Pta. Peñasco (Keen, 1971); Puertecitos (DuShane, 1962); 16N-31N (Bernard, 1983)

Petricola denticulata Sowerby, 1834
Proc. Zool. Soc. London for 1834:46 [Fig'd Reeve (1874, *Petricola*, pl. 2, figs. 9a,b)]
Figure reference: Keen #481
SDNHM 86923, 6 spec. and 1 v., 24-44 mm L, San Luis Gonzaga, dead among and under stones, Apr. 1967
SDNHM 86924, 1 spec., 36 mm L, Puertecitos, dead under stones, 20 Oct. 1965
Distribution: La Paz, through the Gulf and to Paita, Peru (Keen, 1971); 5S-29N (Bernard, 1983)

COOPERELLIDAE

Cooperella subdiaphana (Carpenter, 1864b)
Rept. Brit. Assoc. Adv. Sci. for 1863:639 [Fig'd Palmer (1958, pl. 12, figs. 6-16)]
Synonym: *Oedalia (Cooperella) scintillaeformis* Carpenter, 1864b:611 [nomen nudum]; 1864b:639 [with description]
Figure reference: Keen #485
SDNHM 86925, 5 v., 7-13 mm L, Playa Alicia, from grunge
Remarks: Dall (1900) redescribed the genus *Cooperella* with its type as *C. subdiaphana* and placed *C. scintillaeformis* in synonymy.
Distribution: "Best known in southern California... British Columbia, to the head of the Gulf at San Felipe." (Keen, 1971); 25N-40N (Bernard, 1983)

MACTRIDAE

Mactra dolabriformis (Conrad, 1867)
Amer. Jour. Conch. 3(2):193 [Fig'd Conrad (1869, pl. 12, fig. 1)]
Figure references: Keen #489 and [Figure 49 from Conrad (1869)]
SDNHM 86926, 12 spec., 18-83 mm L, and 1 v., 85 mm L, Bahía San Felipe and N to El Paraíso, alive on sandbars

Distribution: Southern California to Panama (Keen, 1971); 9N-33N (Bernard, 1983)

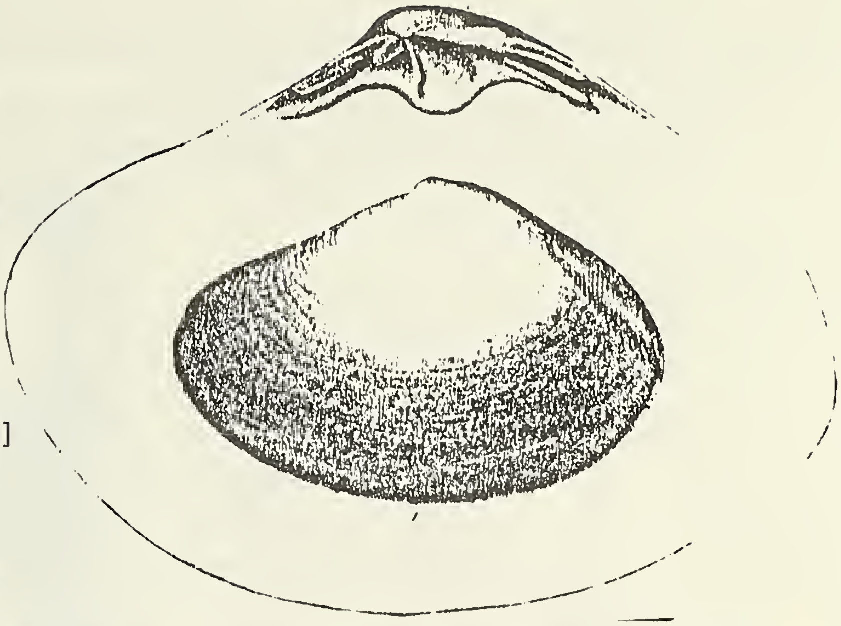


Figure 49. *Mactra dolabriformis* (Conrad, 1867). From Conrad (1869, pl. 12, fig. 1). No size given. Type locality: Panama

Mulinia ?coloradoensis Dall, 1894

Nautilus 8(1):5-6, pl. 1 (top figure)

Figure reference: Keen #503 [lower figure *M. coloradoensis*--upper figure *M. modesta* Dall, 1894, from Dall]

SDNHM 86927, 4 spec., 10-19 mm L and 1v., 72 mm L, Pta. San Felipe, after storms

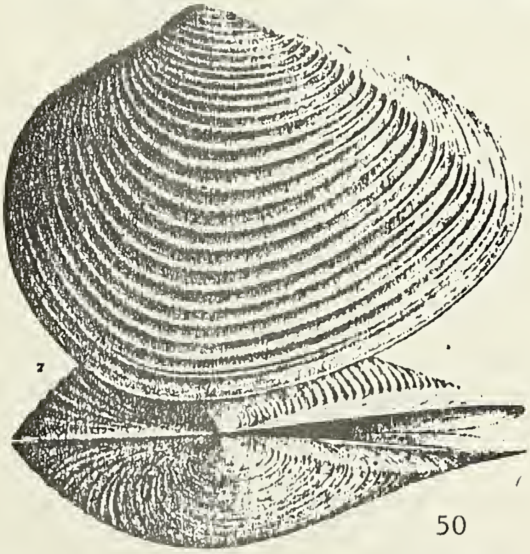
Remarks: Museum specimens of *Mulinia* studied labeled both *M. coloradoensis* and *M. pallida* (Broderip and Sowerby, 1829), showed wide variation both within lots and among different lots. Grant and Gale (1931:401-402) synonymized *M. coloradoensis, M. acuta,* and *M. modesta* all of Dall (1894), with *Mulinia pallida.* Keen (1971) and Bernard (1983) consider *M. pallida* and *M. coloradoensis* as valid species. We have listed this species provisionally as *M. coloradoensis* since few Gemmell specimens were collected and since the type locality is "head of the Gulf in the estuary of the Colorado River."

Distribution: Restricted to the Gulf and West Mexican area (Keen, 1971); 19N-30N (Bernard, 1983)

Raeta undulata (Gould, 1851)

Proc. Boston Soc. Nat. Hist. 4:87-93 [not seen] Fig'd Gould (1853, pl. 15, fig. 7)

Figure references: Keen #505 and [Figure 50 (from Gould,1853) and Figure 51]



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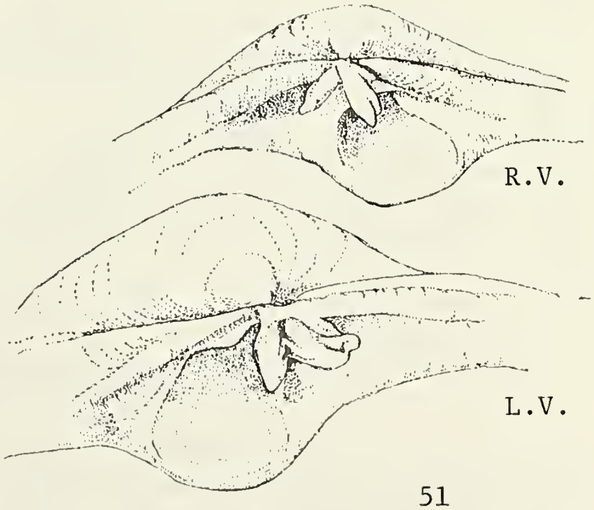


51

Figures 50-51. *Raeta undulata* (Gould, 1851). 50) Type (from Gould,1853), 2.5 x 2.0 in. (per Gould). Type locality: La Paz (from Gould, 1853). 51) Gemmell specimens (SDNHM 86928), detail of hinge. R.V., 32 mm L, L.V., 51 mm L

SDNHM 86928, 1 spec. and 10 v., 43-105 mm L, Pta. San Felipe, on tidal flats N of the Point, after storms

Remarks: The San Felipe specimens have a thin pale yellow periostracum which reflects the minute radial striae.

Distribution: San Pedro, California through the Gulf to Peru (Keen, 1971); 9S-34N (Bernard, 1983)

TELLINIDAE

Tellina amianta Dall, 1900a

Proc. USNM 23:303, 317, pl. 3, fig. 12

Figure references: Keen #508 and [Figures 52(holotype) and 53]

SDNHM 86929 (ex G-452S), 12 spec., 3-7 mm L, dredged Chamizal I, [31° 02'30"N to 31°20'18"N and 114° 41'W to 114°48'W] 1.2-8 km (.75-4 mi.) offshore, N of Pta. San Felipe, from 11-25.6 m, 28 June 1968

SDNHM 86930 (ex G-452), 23 v., 6-8.5 mm L, Playa Alicia, in grunge

SDNHM 86931, 1 spec., 13 mm L and 1 v., 10 mm L, Dredged Chamizal II, W of N end of El Muerto, [30°04'30"N; 114°33'42"W] in sand in 11-27.4 m, 8-10 July 1969

Remarks: We are not using subgeneric classifications for this and the next three species since there appears to be considerable confusion relating to *Angulus* Von Mühlfeld, 1811, and *Moerella* Fischer, 1887. See Boss (1966). For comparison of this species with *T. hiberna* [listed below] see Hertz, Myers and Gemmell (1984).

Distribution: The Gulf to Ecuador (Keen, 1971); 2S-31N (Bernard, 1983)

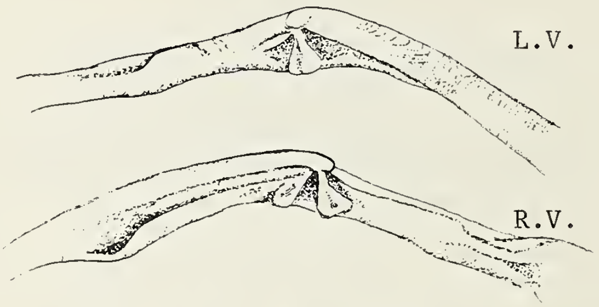


Figure 52. *Tellina amianta* Dall, 1900a. Figured type (USNM 108560), 12.5 mm L, details of hinge

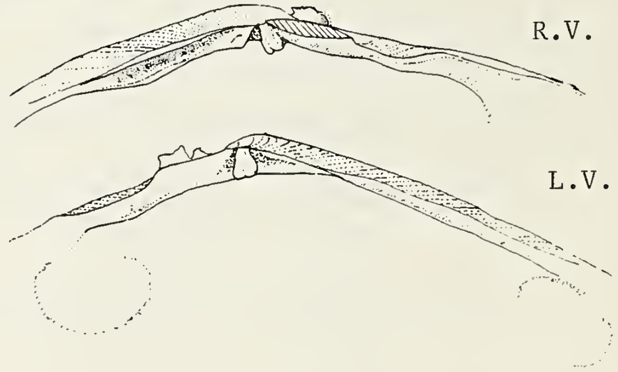


Figure 53. *T. amianta*, Gemmell specimen (SDNHM 86930), 8.5 mm L, details of hinge

Tellina coani Keen, 1971

Sea Shells of Trop. W. Amer.:211, fig. 512

Figure references: Keen #512 and Gemmell, Myers and Hertz (1983, figs. 1-5)

SDNHM 86932 (ex G-453), 36 v., from 2-8.5 mm L, Playa Alicia, in drift, Apr. 1975

Remarks: See Gemmell, Myers and Hertz (1983) for further discussion of this species.

Distribution: Candelero Bay, near La Paz, N through the Gulf to Bahía de Adair, Sonora (Keen, 1971); 24N-31N (Bernard, 1983)

Tellina hiberna Hanley, 1844b

Proc. Zool. Soc. London for 1844:148 [Fig'd in Sowerby (1847, *Tellina* pl. 57, fig. 53)]

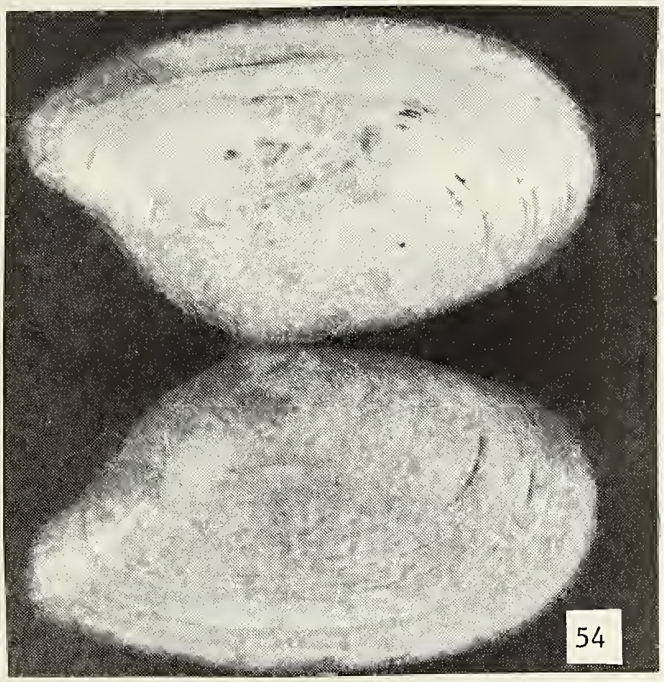
Synonyms: *Tellina panamensis* Dall, 1900a [not Philippi, 1849]; *T. tabogensis* Salisbury, 1934

Figure references: Keen #515 and [Figures 54 and 55 (lectotype) from Hertz, Myers and Gemmell, 1984]

SDNHM 86933, 83 v., and 3 spec., 3-6 mm L, Playa Alicia in intertidal grunge at -6 ft. tide, 28 Mar. 1975

Remarks: For further discussion of this species, see Hertz, Myers and Gemmell (1984)

Distribution: The Gulf to Peru (Keen, 1971); 5S-28N (Bernard, 1983); San Felipe (Hertz, Myers and Gemmell, 1984)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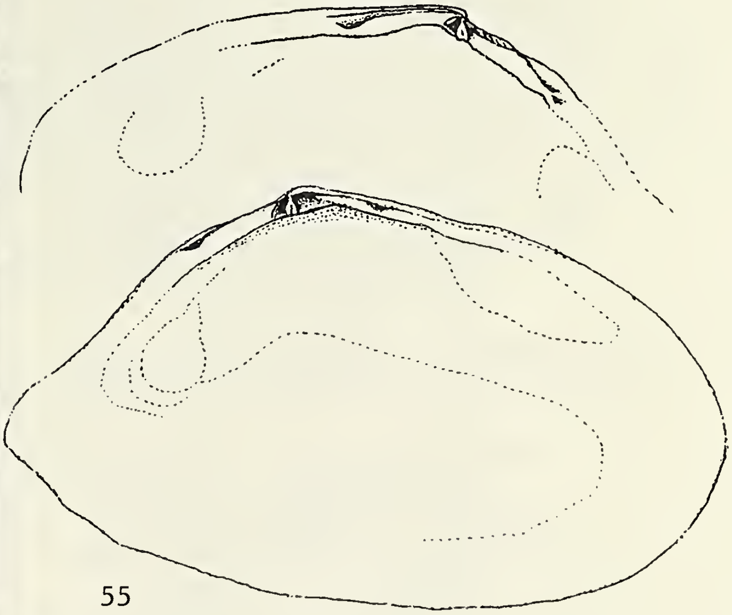

55

Figures 54-55. *Tellina hiberna* Hanley, 1844b. Lectotype, (BMNH 1982296/1) from Hertz, Myers and Gemmell (1984). 20 x 11.5 mm. Type locality: Panama and Bay of Guayaquil. 54) exterior view 55) camera lucida drawings of interior of valves

Tellina meropsis Dall, 1900a

Proc. USNM 23(1210):303, 317, pl. 3, fig. 1

Synonym: *Tellina paziana* Dall, 1900a

Figure reference: Keen #517

SDNHM 86934, 5 spec., 6-14 mm L, Bahía San Felipe, in drift

Distribution: Southern California to Costa Rica (Keen, 1971); 2S-34N (Bernard, 1983)

Tellina (Eurytellina) prora Hanley, 1844b

Proc. Zool. Soc. London for 1844: 61 [Fig'd in Sowerby (1846, vol. 1, *Tellina*, pl. 60, fig. 152)] [not seen]

Figure references: Keen #532 and [Figure 56]

SDNHM 86935, 1 spec., 61.4 mm L, Bahía San Felipe, dead

Remarks: *T. prora* has finer concentric sculpture than *T. simulans* and has a straight dorsal margin. The pallial sinus does not touch the anterior muscle scar.

Distribution: The Gulf to Guayaquil, Ecuador (Keen, 1971); 3S-24N (Bernard, 1983); Puertecitos (DuShane, 1962)

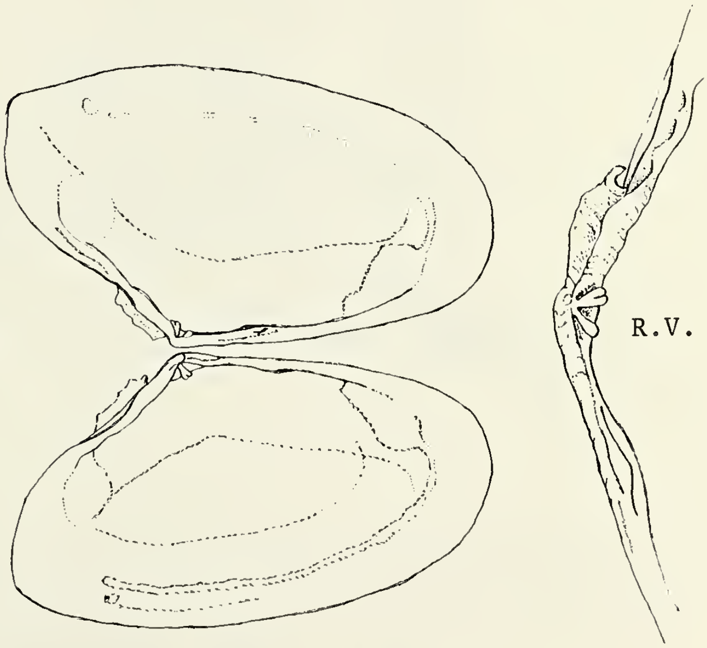


Figure 56. *Tellina (Eurytellina) prora* Hanley, 1844b. Gemmell specimen (SDNHM 86935), 61.4 mm L, interior and detail of hinge

Tellina (Eurytellina) simulans C.B. Adams, 1852

Ann. Lyceum, Nat. Hist. NY 5:284 [Fig'd Turner (1956, pl. 18, figs. 5,6)]

Figure references: Keen #535 and color pl. 13, fig. 3, and [Figure 57]

SDNHM 86936, 18 spec. and 12 v., 5-45 mm L, Playa Alicia, living on sand bars

Remarks: The pallial sinus does not touch the anterior muscle scar. With the valves closed, it has a somewhat warped appearance along the entire dorsal margin.

Distribution: Scammon's Lagoon through the Gulf to Peru (Keen, 1971); 4S-28N (Bernard, 1983)

Tellina (Merisca) reclusa Dall, 1900a

Proc. USNM 23(1210):301, 315, pl. 3, fig. 2

Figure references: Keen #541 and [Figure 58 (lectotype) and Figure 59]

SDNHM 86937, 3 spec., 16-19 mm L, Playa Alicia, on sand flats and N of Pta. San Felipe, May 1968

Remarks: Although we have been unable to determine if *Tellina reclusa* and *T. brevirostris* Deshayes, 1855 are both valid species [See Myers, Gemmell and Hertz (1983)]. The Gemmell specimens most closely resemble the lectotype of *T. reclusa* (Figures 58, 59). For further information on this species, see Myers, Gemmell and Hertz (1983).

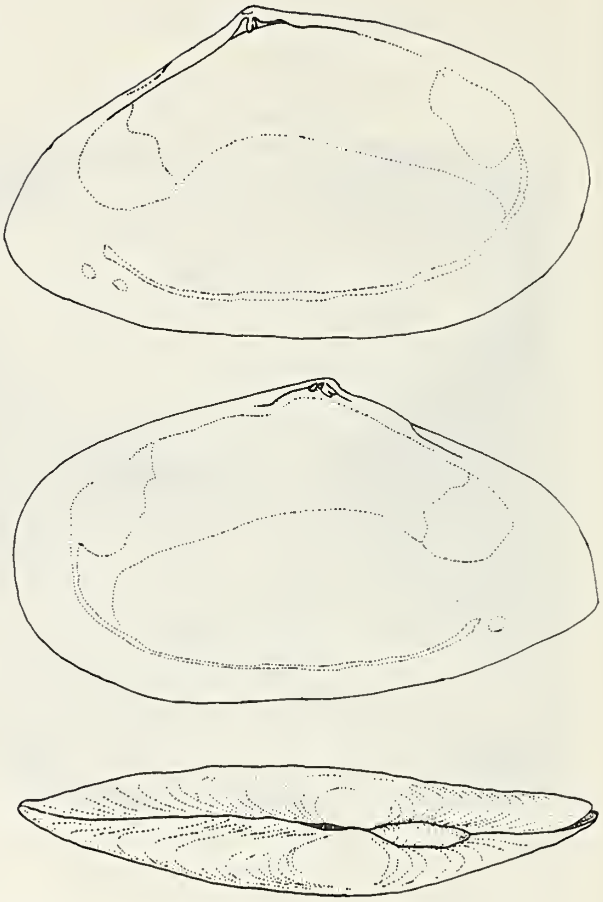


Figure 57. *Tellina (Eurytellina) simulans* C.B. Adams, 1852. Gemmell specimen (SDNHM 86936), 22.5 mm L, interior and umbonal views

Distribution: San Ignacio Lagoon to Panama (Keen, 1971); 1S-26N (Bernard, 1983); Bahía Magdalena on the outer coast and San Felipe to Guatemala (Myers, Gemmell and Hertz, 1983).

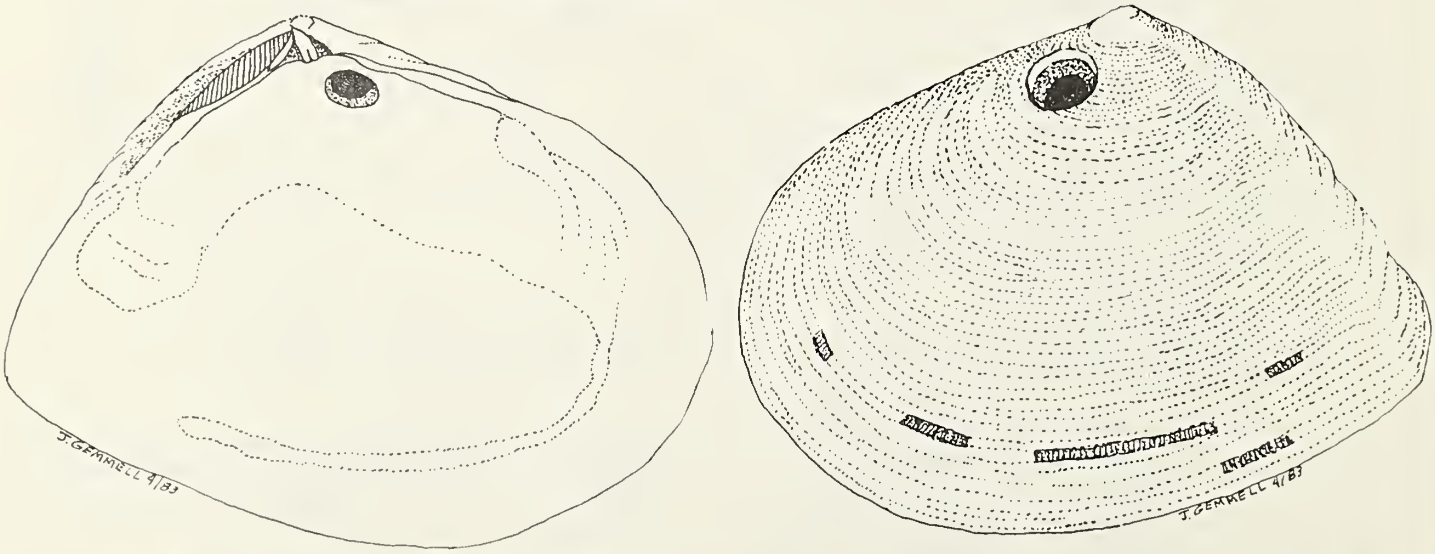


Figure 58. *Tellina (Merisca) reclusa* Dall, 1900a. Lectotype (USNM 105513), 20 x15 mm, Type locality: San Ignacio Lagoon, camera lucida drawings of interior and exterior of left valve

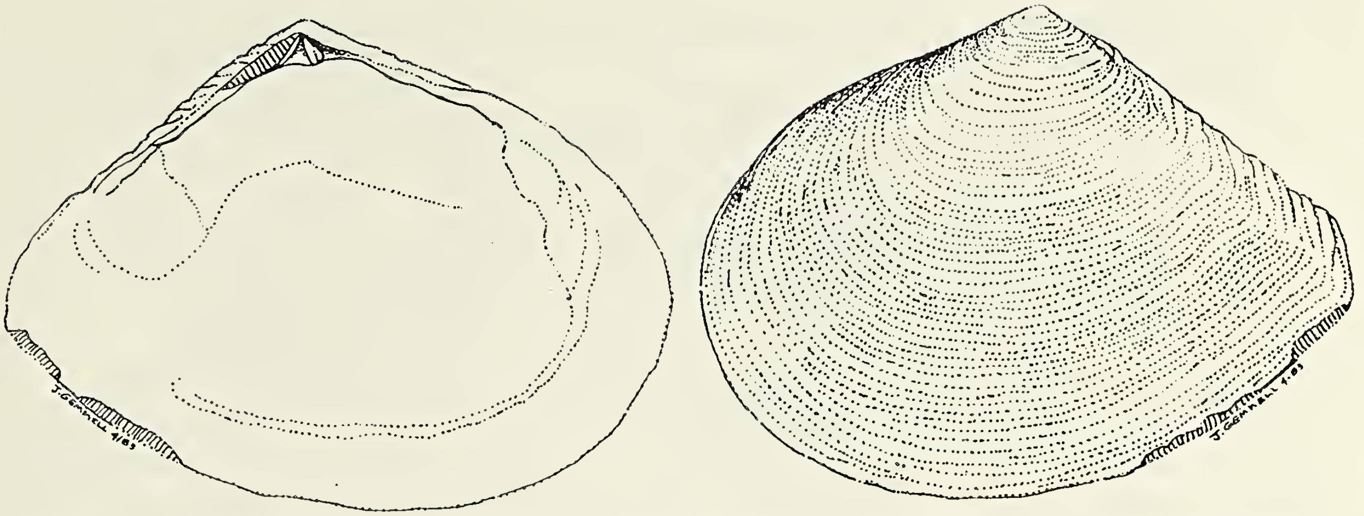


Figure 59. *Tellina (Merisca) reclusa* Dall, 1900a. Gemmell specimen (SDNHM 86937), 19 x14 mm, camera lucida drawings of interior and exterior of left valve

Tellina (Merisca) rhynchoscuta (Olsson, 1961)
- Moll. Trop. E. Pac.:382, pl. 70, figs. 3-3b
- Figure references: Keen #542 and [Figure 60]
- SDNHM 86938, 6 v., 8-24 mm L, San Luis Gonzaga, in drift, Apr. 1967-1976
- Remarks: This species is closely related to *T. cristallina* Spengler, 1798, an Atlantic species.
- Distribution: San Ignacio Lagoon, Baja California, through the Gulf to Ecuador (Keen, 1971); 1S-31N (Bernard, 1983)

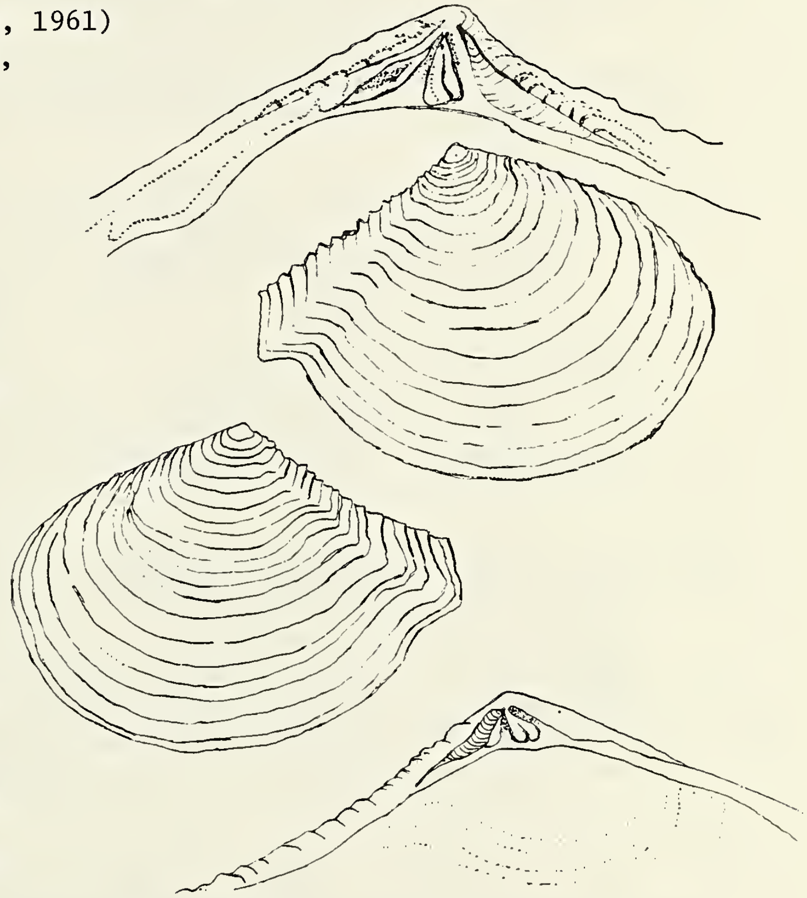


Figure 60. *Tellina (Merisca) rhynchoscuta* (Olsson, 1961), Gemmell specimen (SDNHM 86938) 14.0 mm L, exterior and details of hinge of right and left valves

Tellina (Merisca) ulloana Hertlein, 1968
- Veliger 11(1):80 [Fig'd Hertlein and Strong (1949, pl. 1, figs. 6,7, 14)]
- Synonyms: *Tellina proclivis* Hertlein and Strong, 1949, [of authors]; *T. declivis* Sowerby, 1868 [of authors]
- Figure references: Keen #543 and Gemmell, Hertz and Myers (1980, figs. 10-12)
- SDNHM 86939, 20 v., 6.4-10 mm L, Bahía San Felipe, 3.2 km (2 mi.) offshore, dredged in 15.2 m, 1 Apr. 1973
- SDNHM 86940, 1 spec., 7 mm L, from seastar stomach, Chamizal I, dredged from Pta. Estrella S for 35.4 km (22 mi.), [30°41'N to 30°51'12"N and 114°32'W

to 114°41'W] 4.8 km (3 mi.) offshore on sandy bottom in 9.1-18.3 m, 27 June 1968
Remarks: For nomenclatural history see Hertlein (1968); Gemmell, Hertz and Myers (1980)
Distribution: Bahía Magdalena to Panama (Keen, 1971); 8N-25N (Bernard, 1983). Gemmell, Hertz and Myers (1980) extended the distribution to San Felipe.

** *Tellina (Scissula) virgo* Hanley, 1844b
Proc. Zool. Soc. London for 1844:143 [Fig'd in Sowerby (1846, vol. 1, *Tellina*, pl. 57, fig. 42)] [not seen]
Figure references: Keen #550 and [Figure 61]
SDNHM 86941, 8 spec. and 6 v., 5-19 mm L, Playa Alicia, alive on sand bars, Feb. 1967
Distribution: Bahía Magdalena to Peru (Keen, 1971); 4S-25N (Bernard, 1983)

Tellina (Tellinella) cumingii Hanley, 1844b
Proc. Zool. Soc. London for 1844: 59 [Fig'd in Sowerby (1846, vol. 1, *Tellina*, pl. 58, fig. 72)] [not seen]
Figure reference: Keen #551
SDNHM 86866, 1 v., 59 mm L, Bahía Willard, Apr. 1966
Distribution: Through the Gulf and S to Colombia (Keen, 1971); 9N-25N (Bernard, 1983)

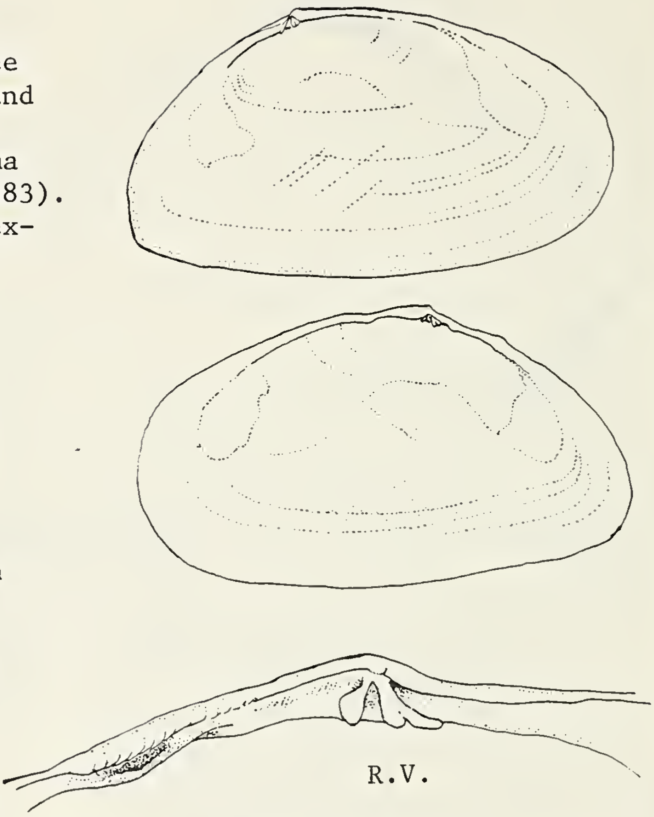


Figure 61. *Tellina (Scissula) virgo* Hanley, 1844b. Gemmell specimen (SDNHM 86941), 16.5 mm L, interior of valves and detail of hinge

Leporimetis cognata (Pilsbry and Vanatta, 1902)
Proc. Wash. Acad. Sci. 4:556, pl. 35, fig. 5
Synonym: *Apolymetis cognata clarki* Durham, 1950
Figure reference: Keen #557
SDNHM 86867, 8 v., 56-58 mm L, N of Pta. San Felipe
Remarks: *Leporimetis* Iredale, 1930, is a senior synonym of *Florimetis* Olsson and Harbison, 1953. See Coan (1971) and Keen and Coan (1975).
Distribution: The Gulf to N Peru and Galapagos Is. (Keen, 1971); 4S-30N (Bernard, 1983)

Macoma undulata (Hanley, 1844b)
Proc. Zool. Soc. London for 1844:72 [Fig'd in Sowerby (1846, vol. 1, *Tellina*, pl. 59, figs. 107, 107a)] [not seen]
Synonym: *Cymatoica occidentalis* Dall, 1890
Figure reference: Keen #559
SDNHM 90101, 4 spec. and 2 v., 6-14 mm L, S of Playa Blanca and N of Pta. San Felipe (beach has no name), on tide flats, Nov. 1968
SDNHM 90102, 13 v., 10-13 mm L, Bahía San Felipe, in drift
SDNHM 90103, 1 spec. and 1 v., 10.5-11.3 mm L, dredged, Chamizal II, W of N end of El Muerto, 1.6 km (1 mi.) offshore [30°04'30"N; 114°33'42"W] on sand bottom in 36-90 m
Remarks: A juvenile specimen reported from seastar stomach (Gemmell, Hertz and Myers (1980) is lost.

Distribution: The Gulf to Ecuador (Keen, 1971); 2S-24N (Bernard, 1983)

Macoma elytrum Keen, 1958a
Bull. Amer. Paleo. 38(172);244, pl. 30, fig. 14
Synonym: *Tellina elongata* Hanley, 1844b [not Dillwyn, 1823]
Figure reference: Keen #562
SDNHM 90104, 2 v., 25 and 28 mm L, Pta. Estrella, in mud
SDNHM 90105 (ex G-442AS), 1 spec., 6 mm L, from seastar stomach, dredged Chamizal I, [31°12'N to 31°12'12"N and 114°17'26"W to 114°31'20"W] 8.0 km (5 mi.) S of Consag Rock to 16 km (10 mi.) ENE of the rock in approx. 20.1-38.4 m, in sand and clay, 29 June 1968
Distribution: Offshore Baja California through the Gulf and S to Ecuador (Keen, 1971); 1S-31N (Bernard, 1983)

Macoma siliqua (C.B. Adams, 1852)
Ann. Lyceum Nat. Hist. NY:284 [Fig'd Turner (1956, pl. 19, figs. 15, 16)]
Synonym: *Thracia carnea* Mörch, 1860
Figure references: Keen #566 (top two valves) and Gemmell, Myers and Hertz (1984, figs. 1-3)
SDNHM 90106, 18 spec. and 4 v., 12-18 mm L, dredged off Pta. Estrella in mud, May 1968 and common in drift in all areas
Remarks: *M. panamensis* Dall, 1900a and *M. panamensis spectri* Hertlein and Strong, 1949 differ significantly from *M. siliqua*. See Gemmell, Myers and Hertz (1984).
Distribution: Panama and San Felipe (Gemmell, Myers and Hertz, 1984)

Macoma indentata Carpenter, 1864b
Rept. Brit. Assoc. Adv. Sci. for 1863:611, 639 [Fig'd Palmer (1958, pl. 16, figs. 1,2)]
Synonym: *Macoma tenuirostris* Dall, 1900a
Figure reference: Keen #568
SDNHM 90107, 16 v., 42.2-55 mm L, N of Pta. San Felipe
Remarks: See Coan (1971) for discussion of this species.
Distribution: La Paz to the N end of the Gulf (Keen, 1971); 28N-41N (Bernard, 1983)

Psammotreta aurora (Hanley, 1844b)
Proc. Zool. Soc. London for 1844:147 [Fig'd in Sowerby (1846, vol. 1, *Tellina*, pl. 58, fig. 76)]
Figure reference: Keen #569
SDNHM 90108, 6 v., 21-31 mm L, Playa Alicia, on the reef at a -6 ft. tide, 15 Mar. 1976
Distribution: The Gulf to Boca de Pan, Peru (Keen, 1971); 4S-29N (Bernard, 1983)

Psammotreta viridotincta (Carpenter, 1856a)
Proc. Zool. Soc. London:160
Synonym: *Macoma pacis* Pilsbry and Lowe, 1932
Figure reference: Keen #572
SDNHM 90000 (ex G-448S), 2 spec., 14-15.5 mm L, from seastar stomachs, dredged Chamizal I, from Pta. Estrella S for a distance of 35.4 km (22 mi.) [30°41'N to 30°51'N and 114°32'W to 114°41'W] approx. 4.8 km (3 mi.) offshore on sandy bottom in 9.1-18.3 m, 27 June 1968
SDNHM 90001, 18 spec., 16-42 mm L, Bahía San Felipe, alive on sand bars and in drift
Remarks: This species is eaten by *Polinices recluzianus* (Deshayes, 1839)
Distribution: The Gulf to Panama (Keen, 1971); 9N-30N (Bernard, 1983)

Strigilla cicercula (Philippi, 1846)
Zeit. f. malak. 3:19

Figure references: Keen #575 and [Figure 62]

SDNHM 90002 (ex G-449S), 3 spec. and 4 v., 3-8.5 mm L, from seastar stomachs, dredged Chamizal I, from 8 km (5 mi.) S of Consag Rock to 16 km (10 mi.) ENE of the rock [31°12'N to 31°12'12"N and 114°17'36"W to 114°31'30"W] in approx. 2-32 m in sand and clay, 29 June 1968

SDNHM 90003, 38 spec. and 100 v., 10.4-25 mm L, Bahía San Felipe, alive in drift and grunge

SDNHM 90004, 27 spec. and 35 v., 4.0-10.6 mm L, San Luis Gonzaga

Remarks: We found the pink color to be in the center of the valve although some were all white. Afshar (1969) gives a detailed description from Philippi's original collection but did not figure the type

Distribution: The Gulf to Ecuador (Keen, 1971); 2S-30N (Bernard, 1983)

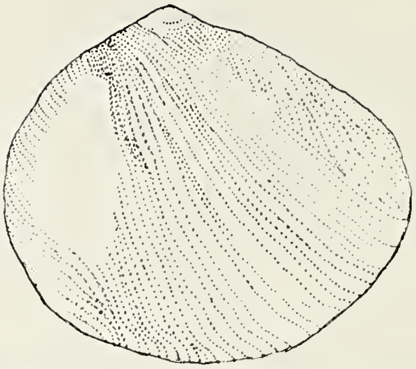


Figure 62. *Strigilla cicercula* (Philippi, 1846). Gemmell specimen (SDNHM 90004), 8.0 mm L, exterior of left valve

Strigilla dichotoma (Philippi, 1846)

Zeit f. Malak. 3:20

Figure references: Keen #576 and [Figure 63]

SDNHM 90005, 1 spec., 7 mm L, San Luis Gonzaga, in drift, Apr. 1967

Remarks: This species is similar in appearance to *S. cicercula*. Comparison of the drawings of the two species (Figures 62 and 63) show the differences in the exterior sculpture with *S. dichotoma* having coarser sculpture which curves posteriorly.

Distribution: The Gulf to Ecuador (Keen, 1971); 3S-29N (Bernard, 1983)

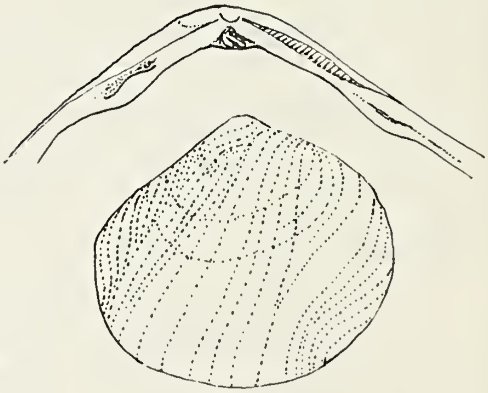


Figure 63. *Strigilla dichotoma* (Philippi, 1846). Gemmell specimen (SDNHM 90005), 7 mm L, hinge and exterior of right valve

** *Strigilla serrata* (Mörch, 1860)

Malak. Blätter 7(4):189

Synonym: *Strigilla strata* Olsson, 1961

Figure references: Keen #580 (from type lot) and [Figure 64]

SDNHM 90006, 4 spec. and 15 v., 6-9 mm L, Playa Alicia, in grunge at minus tide, 28 Mar. 1975

SDNHM 90007, 1 v., 7 mm L, dredged, Chamizal II W of Isla San Luis [29°57'48"N; 114°28'W] .8 km (.5 mi.) offshore, in sand and pumice in 25.6 m, 8-10 July 1969

Remarks: Lots in the SDNHM collection are from Pta. Willard (#44333), San Felipe (#12941 and #600) and Mazatlán (#28519)

Distribution: Keen (1971) noted that the type locality was not stated but was "probably El Salvador or Nicaragua" and extended S to Ecuador. 2S-27N (Bernard, 1983)

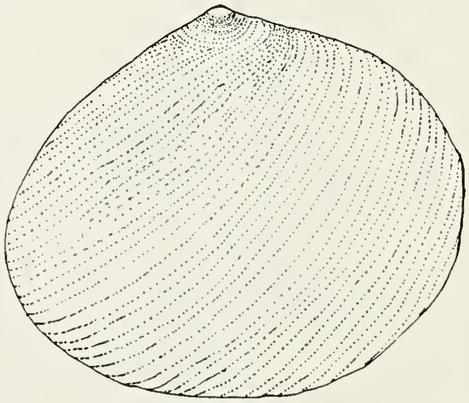


Figure 64. *Strigilla serrata* (Mörch, 1860), Gemmell specimen (SDNHM 90006), 7.5 mm L, exterior of right valve

Tellidora burneti (Broderip and Sowerby, 1829)

Zool. Jour. 4:362, pl. 9, fig. 2

Figure reference: Keen #581
SDNHM 90008, 5 spec. and 8 v., 2-32 mm L, Bahía San Felipe, living on mud flats and sand bars, Jan. 1964
SDNHM 90009, 1 v., 4 mm L, Playa Alicia, in grunge
Distribution: Baja California, throughout the Gulf to Salango, Ecuador (Keen, 1971); 2S-31N (Bernard, 1983)

DONACIDAE

Donax californicus Conrad, 1837
Jour. ANSP 7(2):254, pl. 19, fig. 21
Synonym: *Donax navicula* Hanley, 1845
Figure references: Keen #584, Coan (1973c, figs. 4,5,6,8); Coan (1983, fig. 31) and Gemmell, Hertz and Myers (1980, fig. 14 as *D. navicula*)
SDNHM 90010, 6 spec., 17-20 mm L, Playa Alicia, intertidally on low or minus tides, alive on sand, N of rock ledges
SDNHM 90011, 22 spec., 5-22 mm L, Bahía San Felipe, on sand bars at minus tides
SDNHM 90012 (ex G-451S), 4 spec., 2.5-6.0 mm L, from seastar stomachs, dredged Chamizal I, from Pta. Estrella S for 35.4 km (22 mi.), [30°41'N to 30° 51'12"N and 114°32'W to 114°41'W] approx. 4.8 km (3 mi.) offshore in 9.1-18.3 m, on sandy bottom, 27 June 1968
Distribution: Ventura County, California throughout the Gulf to Peru (Coan, 1983)

Donax gracilis Hanley, 1845
Proc. Zool. Soc. London for 1845:15 [Fig'd Reeve (1854, vol. 8, *Donax*, pl. 6, fig. 38)]
Figure references: Keen #591 and color, pl. 13, fig. 2 and Coan (1983, fig. 32)
SDNHM 90013, 4 spec. and 2 v., 12-23 mm L, Playa Alicia, in sand, alive, Mar. 1976
SDNHM 90014, 13 spec. and 82 v., 2-7 mm L, Playa Alicia, in grunge
Distribution: Bahía San Bartolome, Baja California, to Peru and throughout the Gulf (Coan, 1983)

PSAMMOBIIDAE

Gari (Gobraeus) helenae Olsson, 1961
Moll. Trop. E. Pac.:357, pl. 63, figs. 12, 12a
Synonym: *Gari regularis* of authors [not of Carpenter, 1864]
Figure references: Keen #603 and Myers, Gemmell and Hertz (1984, figs. 1-5)
SDNHM 90015, 3 spec. and 1 v., 25-49 mm L, Bahía Willard, alive, 1966
Remarks: For discussion of the hinge/ligament, comparison with closely related species and comments on distribution, see Myers, Gemmell and Hertz (1984).
Distribution: The Gulf to Panama and Colombia (Keen, 1971); 4N-29N (Bernard, 1983)

Heterodonax pacificus (Conrad, 1837)
Jour. ANSP 7(2):241, pl. 18, fig. 13
Synonyms: *Tellina vicina* C.B. Adams, 1852; *Donax ovalina* Reeve, 1854 [ex Deshayes MS]; *Heterodonax bimaculatus purpureus* Williamson, 1893; *H. bimaculatus salmoneus* Williamson, 1893
Figure references: Keen #609 and Coan (1973b, figs. 8-13 and 23)
SDNHM 90016, 18 spec., 14-25 mm L, Puertecitos, intertidally, alive in drift
Distribution: Southern California to Panama (Keen, 1971); 4S-34N (Bernard, 1983)

Sanguinolaria tellinoides A. Adams, 1850
Proc. Zool. Soc. London:170, pl. 6, fig. 6
Synonyms: *Tellina miniata* Gould, 1851; *Sanguinolaria purpurea* Deshayes, 1855

Figure reference: Keen #611
SDNHM 90017, 26 spec., 12-58 mm L and 3 v., 12-14 mm L, Playa Alicia, valves collected at minus tides
Distribution: The Gulf to Ecuador (Keen, 1971); 2S-30N (Bernard, 1983)

SOLECURTIDAE

Tagelus peruvianus Pilsbry and Olsson, 1941
Proc. ANSP 93:70-71, pl. 18, fig. 5
Figure reference: Keen #623
SDNHM 90018, 12 spec. and 7 v., 9-89 mm L, Bahía Puertecitos, alive in mud on east side of bay
SDNHM 90019, 1 spec. and 1 v., 13 and 19 mm L, dredged, Chamizal II, W of N end of El Muerto [30°04'30"N; 114°33'42"W] in 36-90 m, approx 1.6 km (1 mi.) offshore in sand
Distribution: Pta. Diggs to Negritos, Peru (Keen, 1971); 5S-31N (Bernard, 1983)

SEMELIDAE

Semele bicolor (C.B. Adams, 1852)
Ann. Lyceum Nat. Hist. NY:512 [Fig'd Turner (1956, pl. 18, figs. 7,8)]
Synonyms: *Amphidesma ventricosum* C.B. Adams, 1852; *Semele fucata* Mörch, 1860
Figure references: Keen #625 and [Figure 65]
SDNHM 90020, 3 spec. and 2 v., 13-24.5 mm L, Bahía Willard, on sand flats, Apr. 1967
Distribution: The Gulf to Panama (Keen, 1971); 8N-24N (Bernard, 1983)

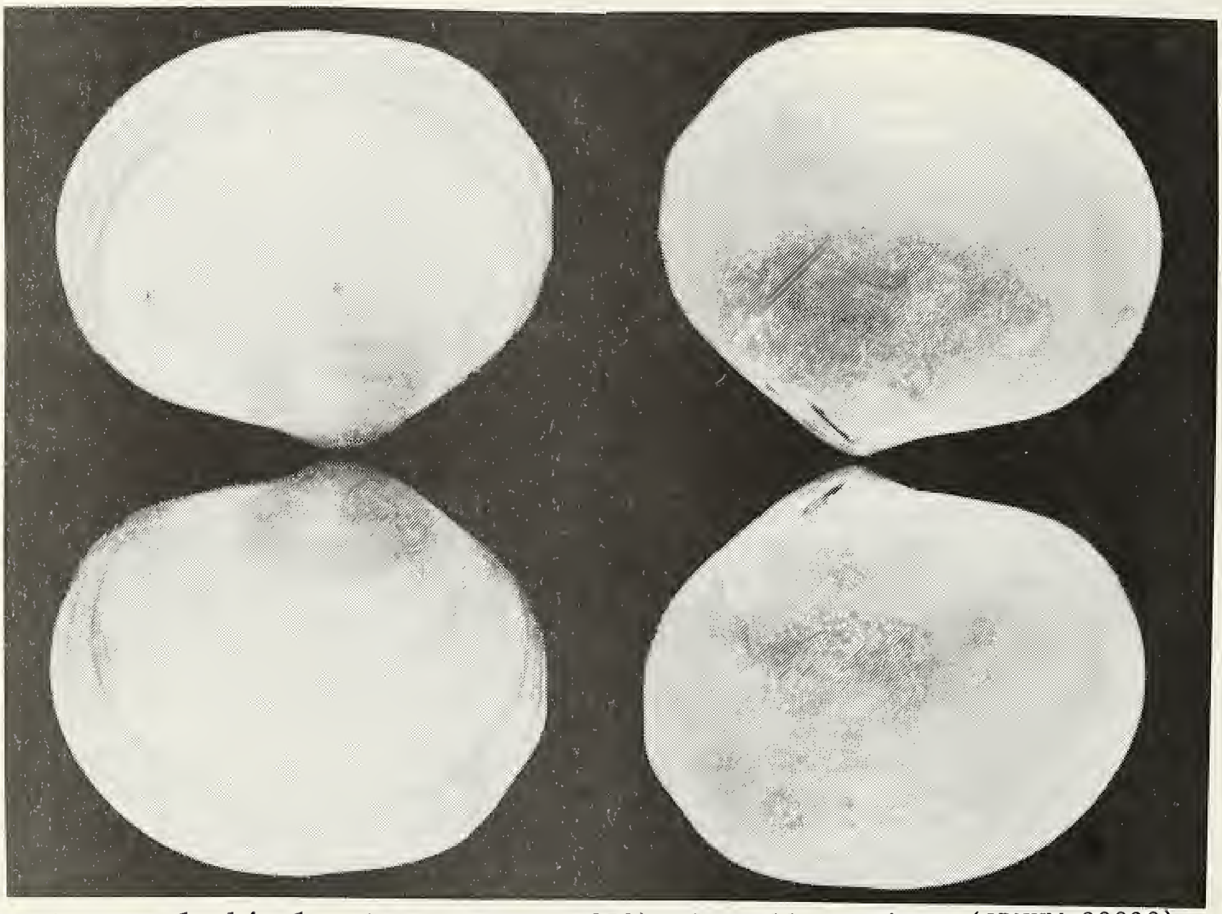
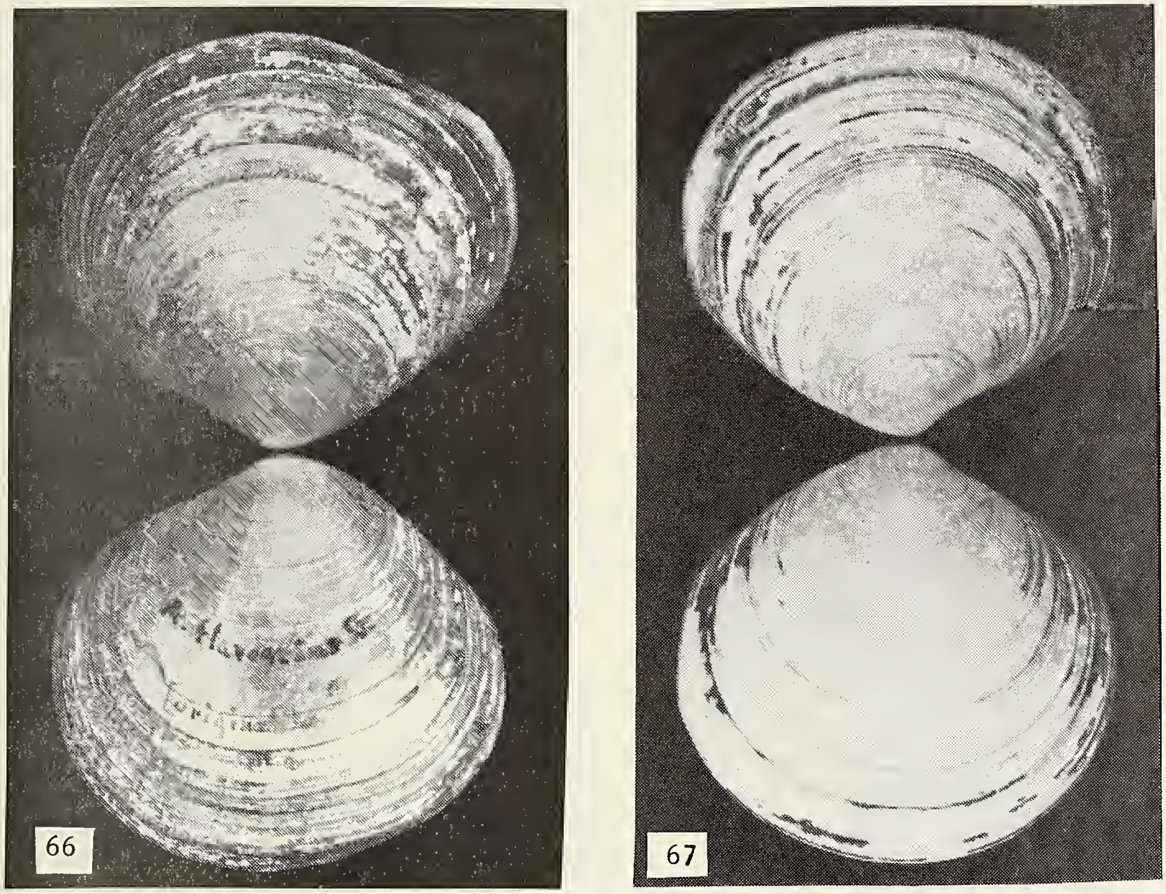


Figure 65. *Semele bicolor* (C.B. Adams, 1852). Gemmell specimen (SDNHM 90020), 24.5 mm L, exterior and interior views

Semele flavescens (Gould, 1851)
Proc. Boston Soc. Nat. Hist. 4:89
Synonym: *Amphidesma proximum* C.B. Adams, 1852
Figure references: Keen #630 and [Figure 66 (holotype) and Figure 67 (Gemmell specimen)]
SDNHM 90021, 6 spec., 19.6-80 mm L, Bahía San Felipe, between and under rocks
SDNHM 90022, 2 spec., 18.2 and 22.3 mm L, Bahía Willard, in drift, Apr. 1967
Remarks: Gould listed the type locality as San Diego. Coan (1973a:325) suggested that the "type locality of *S. flavescens* was in error."
Distribution: Throughout the Gulf and S to Peru (Keen and Coan, 1975); 2S-30N (Bernard, 1983)



Figures 66 and 67. *Semele flavescens* (Gould, 1851). 66) holotype (MCZ 169157), 60.3 x 54 mm. Type locality: San Diego, California (per Gould, 1851), exterior view 67) Gemmell specimen (SDNHM 90021), 60.5 x 57.9 mm, exterior view

Semele guaymasensis Pilsbry and Lowe, 1932
Proc. ANSP 84:92, pl. 12, figs. 8,9
Figure references: Keen #632 and Gemmell, Hertz and Myers (1980, fig. 15)
SDNHM 90024 (ex G-461S), 1 spec., 11 mm L, from seastar stomach, dredged Chamizal I, from Pta. Estrella S for 35.4 km (22 mi.) [30°41'N to 30°51' 12"N and 114°32'W to 114°41'W] 4.8 km (3 mi.) offshore on sandy bottom in 9.1-18.3 m, 27 June 1968
SDNHM 90025, 16 spec. and 10 v., 4-24 mm L, San Felipe to San Luis Gonzaga, on sand bars, intertidally
Distribution: Pta. Peñasco through the Gulf to La Paz (Keen, 1971); 24N-31N (Bernard, 1983)

Semele jovis (Reeve, 1853)
Conch. Icon. 8 *Amphidesma* pl. 5, fig. 34
Figure reference: Keen #633

SDNHM 90026, 2 spec., 47 and 48 mm L and 1 v., 36 mm L, dredged in 18.3 m between San Felipe and Consag Rock, 3 Nov. 1971

Remarks: "Never found intertidally in the area" (Gemmell). Hertlein and Strong (1949) designated the type locality as Port Parker, Costa Rica. No type locality was noted originally.

Distribution: Bahía Kino through the Gulf to Islas Perlas, Panama (Keen, 1971); 8N-29N (Bernard, 1983). Coan (*in litt*) stated that the species occurs as far north as Bahía Cholla.

****Semele lenticularis** (Sowerby, 1833)

Proc. Zool. Soc. London for 1832:200 [Fig'd Sowerby (1833, *Amphidesma*, fig. 9)]

Synonym: *Amphidesma ventricosum* C.B. Adams, 1852

Figure reference: Keen #636 (holotype)

SDNHM 90023, 1 spec., 24 mm L, Puertecitos, on sand flat

SDNHM 90109, 8 spec. and 2 v., 14.5-22.0 mm L, Bahía Willard, in drift, Apr. 1967

Remarks: These specimens were identified by Dr. Eugene Coan who is currently working on a revision of this group.

Distribution: Barra de Navidad to Peru (Keen, 1971); 3S-19N (Bernard, 1983)

Semele pacifica Dall, 1915a

Proc. ANSP 67:27

Synonym: *Semele jaramija* Pilsbry and Olsson, 1941

Figure references: Keen #637 and color pl. 13, fig. 6

SDNHM 90027 (ex G-462S), 7 spec. and 5 v., 6-12 mm L, from seastar stomachs, dredged Chamizal I, from 3.2 km (2 mi.) SW of Consag Rock to 12.9 km (8 mi.) ENE of it, a distance of approx. 16 km (10 mi.) [31°05'N to 31°20'18"N and 114°21'W to 114°30'30"W], bottom unknown, 28 June 1968

SDNHM 90028, 4 spec., 9.5-20 mm L, Bahía Willard, alive on N beach, Apr. 1967

SDNHM 90029, 9 spec. and 5 v., 6-18 mm L, dredged Chamizal II, inside Bahía Gonzaga, S of Isla Willard [29°47'18"N; 114°22'24"W] in 9.1 m in fine sand, 8-10 July 1969

SDNHM 90030, 1 v., 11 mm L, dredged Chamizal II, W of N end of El Muerto, [30°04'30"N; 114°33'42"W] in 36-90 m, 1.6 km (1 mi.) offshore in sand, 8-10 July 1969

Remarks: *S. pacifica* has radial sculpture on both the anterior and posterior of the valves, differing from *S. guaymasensis* which has radial sculpture only on the anterior of the valves.

Distribution: The Gulf to Panama (Keen, 1971); 9N-31N (Bernard, 1983)

Abra tepocana Dall, 1915a

Proc. ANSP 67:28

Figure reference: Keen #655 [(holotype) USNM 108.552 not 23.700]

SDNHM 90031 (ex G-465S), 2 spec. and 1 v., 2-5 mm L from seastar stomachs dredged Chamizal I, from approx. 8 km (5 mi.) S of Consag Rock to 16 km (10 mi.) ENE of it [31°12'N to 31°12'12"N and 114°17'36W to 114°31'30"W] in 10-38 m in sand and clay, 29 June 1968

SDNHM 90032, 8 spec. and 10 v., 5-11 mm L, same locality as SDNHM 90031 but in sand in 9.1 m

SDNHM 90033, 21 v., 4-10 mm L, Playa Alicia, in intertidal grunge

Distribution: Puerto Peñasco to Cabo Tepoca (Keen, 1971); 29N-31N (Bernard, 1983); San Felipe (DuShane and Brennan, 1969; Gemmell, Hertz and Myers, 1980)

Cumingia lamellosa Sowerby, 1833

Proc. Zool. Soc. London for 1833:34 [Fig'd Sowerby in Reeve (1873, *Cumingia*, vol. 19, pl. 1, fig. 5)]

Synonym: *Cumingia trigonularis* Sowerby, 1833

Figure reference: Keen #657

SDNHM 90034, 1 v., 8 mm L, Bahía Willard, N side of the bay
SDNHM 90035, 2 spec. and 3 v., 4.0-11.0 mm L, Puertecitos, on mud flat, Nov. 1968
SDNHM 90036, 5 spec. and 16 v., 3.3-11.0 mm L, S of Pta. Estrella, in clump of erect bryozoan
Distribution: Isla San Martín through the Gulf to Peru (Keen, 1971); 4S-26N (Bernard, 1983)

Cumingia pacifica (Dall, 1915a)
Proc. ANSP 67:28
Figure references: Keen #659 and Gemmell, Hertz and Myers (1980, fig. 16)
SDNHM 90037 (ex G-466AS), 1 spec., 10 mm L, from seastar stomach, dredged Chamizal I, from approx. 8 km (5 mi.) S of Consag Rock to 16 km (10 mi.) ENE of it [31°12'N to 31°12'12"N and 114°17'36"W to 114°31'30"W] in 10-38 m, in sand and clay, 20 June 1968
SDNHM 90038, 1 spec., 14 mm L, Campo Uno, living in mud between rocks
Distribution: N end of the Gulf to Guaymas (Keen and Coan, 1975); San Felipe (Gemmell, Hertz and Myers , 1980); 26N-42N (Bernard, 1983)

SOLENIDAE

Solen new species A (R. Cosel, in press)
SDNHM 90139 (ex G-467), 6 spec. and 3 v., 26-63 mm L, San Felipe from Playa Alicia to El Paraíso, living on sand bars at the edge of low water at Feb.-Mar. low tides, not common

Solen new species B (R. Cosel, in press)
SDNHM 90140, 5 spec. and 2 v., 36-58 mm L, San Felipe from Playa Alicia to El Paraíso, living on sand bars at edge of low water at Feb.-Mar. low tides

***Solen pfeifferi* Dunker, 1862
Proc. Zool. Soc. London for 1861:420
Synonym: *Solen pazensis* Lowe, 1935 [fide Cosel (in press)]
Figure reference: [Figure 68]
SDNHM 90041 (ex G-469), 65 spec., 23.5-45.5 mm L, San Felipe to Puertecitos, living on sand bars, alive at the edge of low water, seasonal, not common, mostly Feb.-Mar. low tides
Distribution: (for *S. pfeifferi*) Tangola Tangola Bay, Oaxaca to Ecuador, (for *S. pazensis*) La Paz and Tangola Tangola Bay (Keen, 1971); Bahía de los Angeles (for *S. pazensis*) (Coan, 1968)

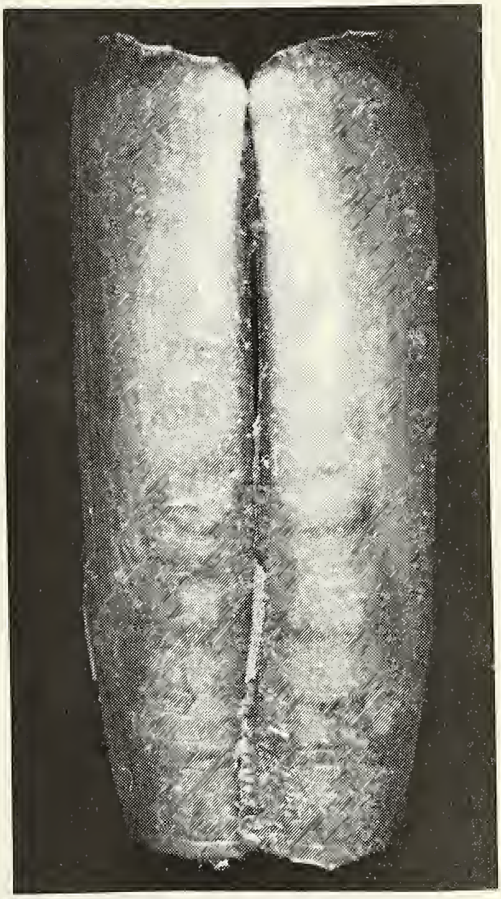


Figure 68. *Solen pfeifferi* Dunker, 1862. Gemmell specimen (SDNHM 90041), 29.9 mm L, exterior view

Ensis nitidus (Clessin, 1888)
In Kuster and Kobelt. System. Conch. Cab. Martini und Chemnitz...Solenaceen:34, pl. 13, fig. 2 (fide Bernard, 1983)
Synonym: *Ensis californicus* Dall, 1899b
Figure references: Keen #669 and [Figures 69 and 70]
SDNHM 90042, 4 spec., 37-50 mm L, San Felipe, living, 1968
SDNHM 90043, 10 spec., 38-55 mm L, El Paraíso, in drift, 1970

Remarks: Bernard (1983) placed *E. californicus* in the synonymy of *E. nitidus*. Cosel (pers. comm.) indicated that there is a problem with the *californicus-myrae-nitidus* group which will be discussed in his forthcoming monograph of the genus *Ensis* Schumacher, 1817.

Distribution: Bahia Magdalena through the Gulf, S to Ecuador (Keen, 1971); 25N-30N (Bernard, 1983)

MYIDAE

Cryptomya californica Conrad, 1837

Jour. ANSP 7(2):234, pl. 17, fig. 11

Figure reference: Keen #671

SDNHM 90044, 20 spec. and 11 v., 15-30 mm L, N of Pta. San Felipe and Playa Alicia, on sand flats and in drift, alive, after winter storms

Distribution: Alaskan Gulf to N Peru (Keen, 1971); 5S-60N (Bernard, 1983)

Sphenia luticola Valenciennes, 1846 in du Petit-Thouars

Atlas de Zoologie, pl. 24, figs. 6, 6a (plates only, no text)

Synonyms: *Tyleria fragilis* H. and A. Adams, 1854; *Sphaenia fragilis* Carpenter, 1857

Figure references: Keen #673 and [Figure 71]

SDNHM 90045, 76 spec. and 18 v., 5-11 mm L, from seastar stomachs, Bahía San Felipe, dredged 3.2 km (2 mi.) offshore in 15.2 m, 1 Apr. 1973

SDNHM 90046, 18 spec., 2-5 mm L, Playa Alicia, in grunge, Mar. 1975

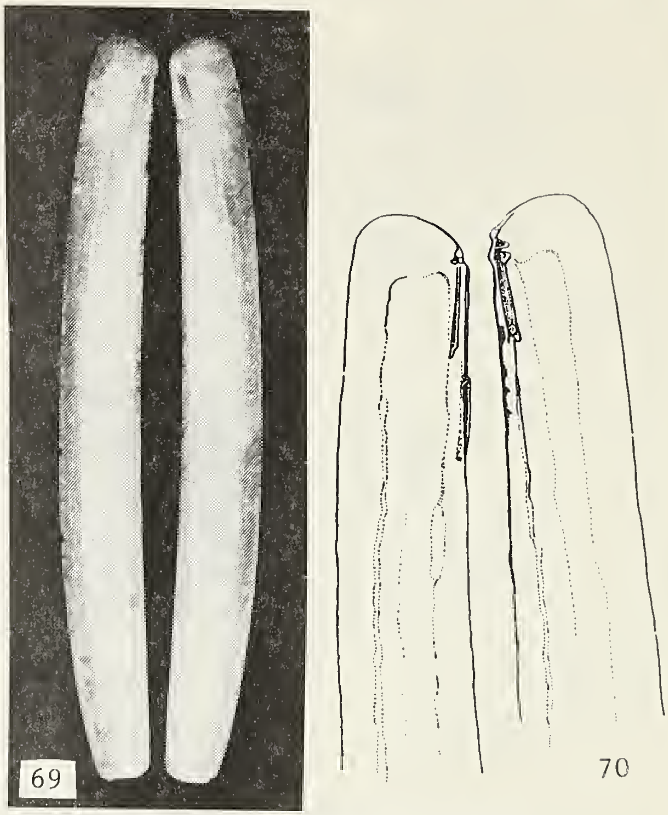
SDNHM 90047, 31 spec., 3-10 mm L, dredged off Puertecitos, 8-10 July 1969 (coordinates not given)

Distribution: California, S through the Gulf to N Peru (Keen, 1971); 4S-40N (Bernard, 1983)

CORBULIDAE

Corbula marmorata Hinds, 1843a

Proc. Zool. Soc. London:58



Figures 69 and 70. *Ensis nitidus* (Clessin, 1888). Gemmell specimen (SDNHM 90043), 49.1 mm L. 69) exterior view 70) camera lucida drawing of interior

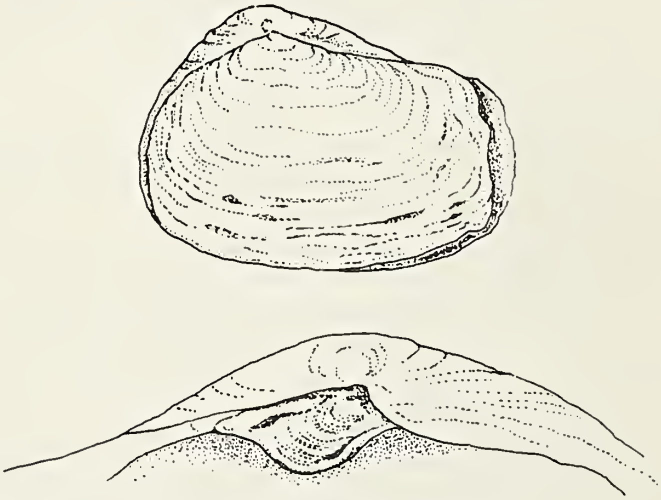


Figure 71. *Sphenia luticola* Valenciennes, 1846. Gemmell specimen (SDNHM 90047), 5 mm L, exterior and detail of ligament in the left valve

[Fig'd Hinds (1845, pl. 20, fig. 13)]

Figure reference: Keen #676

SDNHM 90048, 4 spec. and 22 v., 5.5-8.5 mm L, El Paraíso, in drift

SDNHM 90049, 6 spec. and 28 v., 3-13 mm L, dredged Chamizal II, [30°04'30"N to 30°04'48"N and 114°32'30"W to 114°35'30"W] 3.2 km (2 mi.) N of El Huerfanito in 21.9 m, in fine gravel and clay and W and SW of S end of El Muerto in 14.6-18.3 m, in sand, 8-10 July 1969

Distribution: Sonora, Mexico to Panama (Keen, 1971); 2S-28N (Bernard, 1983)

Corbula cf. *nasuta* Sowerby, 1833

Proc. Zool. Soc. London for 1833:35 [Fig'd Sowerby in Reeve (1843 (2), *Corbula*, pl. 1, sp. 1)]

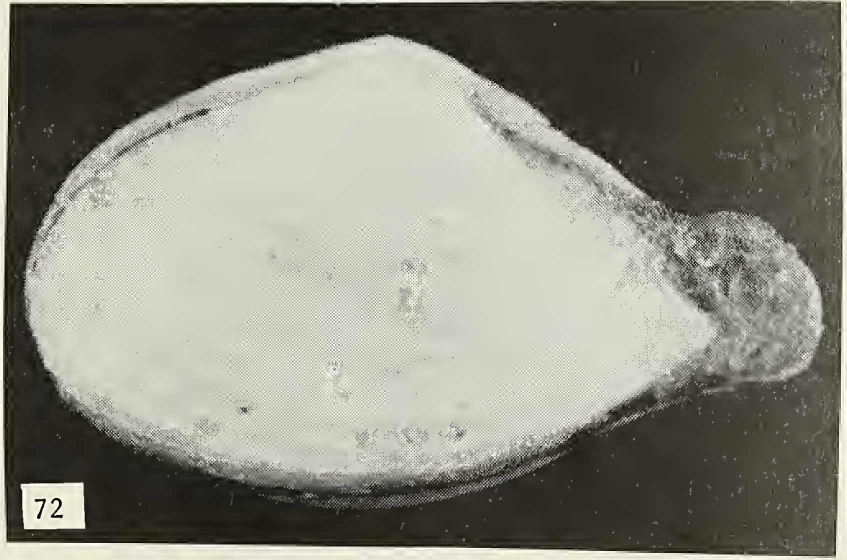
Figure references: [Figures 72 and 73]

SDNHM 90057, 1 spec., 4 mm L, and 65 v., 2.0-6.2 mm L, dredged Chamizal II, 19.3 km (12 mi.) S of Puertecitos [30°13'48"N; 114°36'30"W] in 36.6 m, on sand and mud bottom, 8-10 July 1969

SDNHM 90058, 8 spec. and 1 v., 3.5-7.1 mm L, dredged Chamizal II, W of N end of El Muerto [30°04'30"N; 114°33'42"W] 1.6 km (1 mi.) offshore in 11-24.4 m, on sand, 8-10 July 1969

SDNHM 90059 (ex G-474AS), 143 spec., 3-7.0 mm L. from seastar stomachs, dredged Chamizal I, off Pta San Felipe and Consag Rock, S to Pta. Estrella [30°41'N to 31°20'18"N and 114°17'36"W to 114°48'W], 27-29 June 1968

Remarks: Although the Gemmell specimens appear to us to have features of both *Corbula nasuta* and *C. nuciformis* Sowerby, 1833, we have tentatively assigned these specimens to *C. nasuta* (Figures 72 and 73). The Gemmell specimens are all small (max. length 7 mm) and are more elongately oval than nut-shaped (*nuciformis*). The posterior is acuminately rostrate (*nasuta*) rather than obtusely rostrate (*nuciformis*). Comparison with Sowerby's figures in Reeve (1843) show *nuciformis* to be more swollen and less pointedly rostrate. All of the Gemmell specimens have strong concentric sculpture with some sculpture (under magnification) of beaded radial lines sometimes in groups of two or three (Figure 73). In occasional specimens the concentric ribs are more closely spaced.



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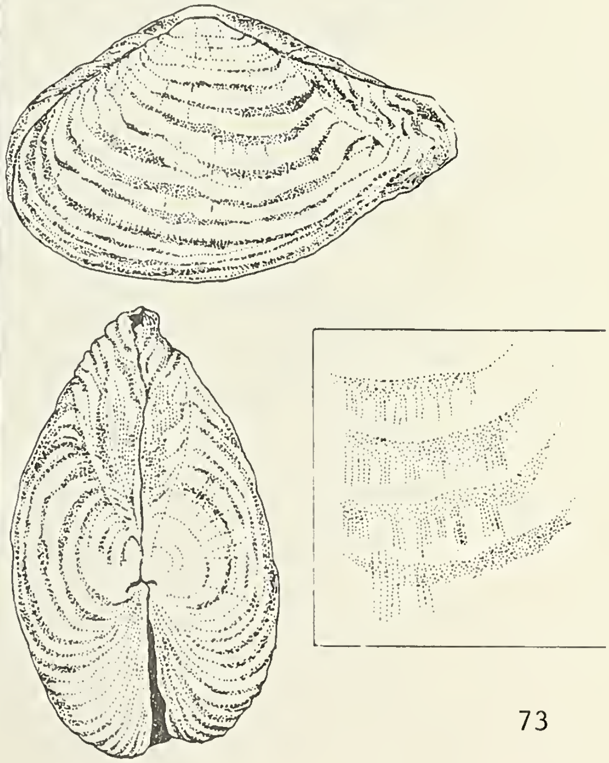

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Figures 72 and 73. *Corbula* cf *nasuta* Sowerby, 1833 Gemmell specimen (SDNHM 90059), 7 mm L, 72) photo of exterior 73) two views of exterior and detail of sculpture

Corbula bicarinata Sowerby, 1833

Proc. Zool. Soc. London for 1833:35 [Fig'd Sowerby in Reeve (1844(2) *Corbula*, pl. 3, sp. 23)]
Figure reference: Keen #684
SDNHM 90060, 12 spec. and 2 v., 7-10 mm L, Pta. San Felipe, under rocks, attached by byssus
Distribution: The Gulf to Ecuador (Keen, 1971); 1S-31N (Bernard, 1983)

GASTROCHAENIDAE

Gastrochaena ovata Sowerby, 1834

Proc. Zool. Soc. London for 1834:21 [Fig'd Sowerby in Reeve (1878(20) *Gastrochaena*, pl. 3, fig. 18 (not fig. 16) *fide* Olsson (1961) and Keen (1971))]
Figure reference: Keen #694 (from Reeve, 1878)
SDNHM 90061, 1 v., 12 mm L, Bahía San Felipe, in soft rock with *Diplothyra curta* (Sowerby, 1834)
Distribution: San Diego to Ecuador (Keen, 1971); 1S-31N (Bernard, 1983)

HIATELLIDAE

Hiatella arctica (Linne, 1767)

Systema naturae, 12th ed.:1113
Figure references: Keen #697 and [Figure 74]
SDNHM 90062, 9 spec., 6-12 mm L, Bahía San Felipe, in bryozoa clump under rocks
SDNHM 90063, 8 spec. and 1 v., 7-20 mm L, Puertecitos, 1 living specimen
Distribution; Entire Arctic and on the west coast S to Panama (Keen, 1971); 10N-71N circumboreal (Bernard, 1983)

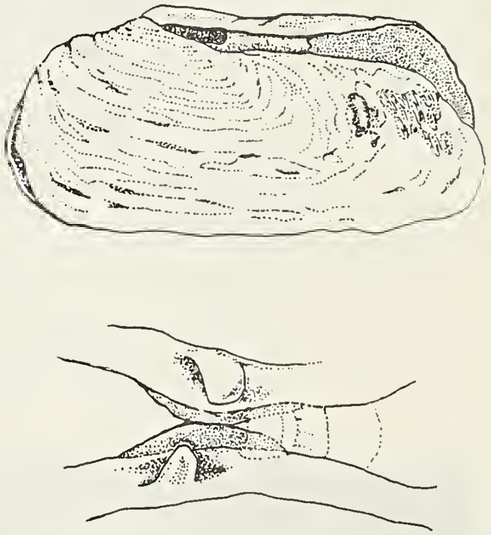

Figure 74. *Hiatella arctica* (Linne, 1767). Gemmell specimen (SDNHM 90063), 8 mm L, exterior and detail of ligamental area

Panopea globosa Dall, 1898

Trans. Wagner Free Inst. 3(4):831 [Fig'd Dall (1902a, pl. 40, fig. 1)]
Figure reference: Keen #699 (from Dall, 1902a)
SDNHM 90064, 3 spec., 79-105 mm L, Radar Beach
SDNHM 90065, 2 spec., 129 and 130 mm L, El Paraíso, alive
SDNHM 90066, 2 v., 156 and 158 mm L, S of Radar Beach
SDNHM 90067, 1 spec., 38 mm L, with body dried in, Playa Alicia, Jan. 1970
SDNHM 90068, 6 spec. and 2 v., 27-45 mm L, Estero La Ramada, dead in drift
Remarks: *Panope* Ménard de la Groye, 1807, has been suppressed. Opinion 1414, Bull. Zool. Nom. 1986, vol. 43(3):258
Distribution: The Gulf to Isla San Marcos (Keen, 1971); 27N-31N (Bernard, 1983)

PHOLADIDAE

Pholas chiloensis Molina, 1782

Saggio Sulla Storia Naturale dei Chile:204 (not seen)
Synonyms: *Pholas laqueata* Sowerby, 1849; *P. retifer* Mörch, 1860; *P. dilecta* Pilsbry and Lowe, 1932
Figure reference: Keen #700 (from Sowerby, 1849)
SDNHM 90069, 1 spec., 130 mm L, Pta San Felipe, dead in place in the clay bed
SDNHM 90070, 5 spec., 68-120 mm L; 5 spec. and 1 v., 10-36 mm L, Playa Alicia, dead in place in the clay bed

SDNHM 90071, 4 v., 98-135 mm L, S end of Bahía San Felipe, in beach drift
SDNHM 90072, 1 spec. and 9 v., 5-13 mm L, Radar Beach, intertidal; 1 spec. found in rock; valves in bryozoa
Distribution: Head of the Gulf to Isla Chiloe (Keen, 1971); 43S-31N (Bernard, 1983)

***Barnea subtruncata* (Sowerby, 1834)
Proc. Zool. Soc. London for 1834:69 [Fig'd Turner (1954, fig. 1, lectotype of *Barnea pacifica)*]
Synonyms: *Pholas spathulata* Deshayes, 1843; *Barnea pacifica* Stearns, 1871
Figure reference: Keen #701
SDNHM 90073, 20 v., 27-59 mm L. Protoplax missing on all specimens. S end of Bahía San Felipe and El Paraíso, on tide flats
Distribution: Turner (1954:34) examined specimens from Bahía Kino and Mendina (Sinaloa). Oregon to Chile (Keen, 1971); 29S-46N (Bernard, 1983). Neither mention the occurrence in the Gulf. Guaymas (DuShane and Poorman, 1967).

Diplothyra curta (Sowerby, 1834)
Proc. Zool. Soc. London for 1834:71 [Fig'd Sowerby (1849, pl. 108, fig. 105)]
Figure references: Keen #708 and [Figure 75]
SDNHM 90074, 5 spec. and 16 v., 8-12 mm L, Bahía San Felipe, embedded in hard mud, rocks and bryozoa
SDNHM 90075, 11 v., 8-14 mm L, Radar Beach, in bryozoa, intertidally
Distribution: Mouth of the Colorado River (Turner, 1954); Head of the Gulf to Ecuador (Keen, 1971); 17N-30N (Bernard, 1983)

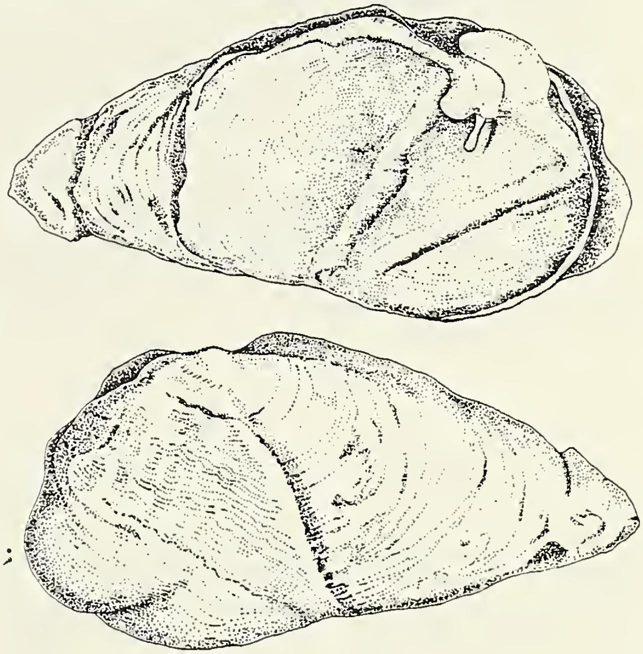
Figure 75. *Diplothyra curta* (Sowerby, 1834) Gemmell specimen (SDNHM 90075), 8 mm L, exterior and interior of left valve

PANDORIDAE

Pandora brevifrons Sowerby, 1835
Proc. Zool. Soc. London for 1835:93
Figure references: Keen #732 and [Figure 76]
SDNHM 90076 (ex G-483S as *Pandora* sp.), 11 spec., 8-11 mm L, from seastar stomachs, dredged Chamizal I, S of Pta. Estrella [30°41'N to 30°51'12"N and 114°32'W to 114°41'W] approx. 4.8 km (3 mi.) offshore in 9.1-18.3 m, in sandy bottom, 27 June 1968
Remarks: This species was listed in Gemmell, Hertz and Myers (1980) as *Pandora* sp. It has a somewhat thin, fragile lithodesma. Although Keen (1971), Olsson (1961), and Hertlein and Grant (1972) state that the lithodesma is lacking in *Pandora s.s.*, Morton (1981:37) states that most pandorids have a lithodesma.
Distribution: Consag Rock, San Felipe (DuShane and Brennan, 1969); type locality in Panama Bay (Keen, 1971); 9N-26N (Bernard, 1983)

Pandora uncifera Pilsbry and Lowe, 1932
Proc. ANSP 84:104-105, pl. 17, figs. 17-19
Figure references: Keen #733 and [Figure 77]
SDNHM 90077, 3 spec. and 1 v., 11-13 mm L, dredged Chamizal II, W of Isla

Salvatierra [29°57'48"N; 114°28'00"W] 0.8 km (0.5 mi.) offshore in 25.6 m, in sand and pumice

SDNHM 90078, 2 v., 6 and 9 mm L, N of Bahía San Luis Gonzaga, in 15.2 m, in broken shell bottom

Remarks: Distinguished from *P. brevifrons* by the hook-like curve at the anterior dorsal margin.

Distribution: Cabo San Lucas to Costa Rica (Keen, 1971); 13N-30N (Bernard, 1983)

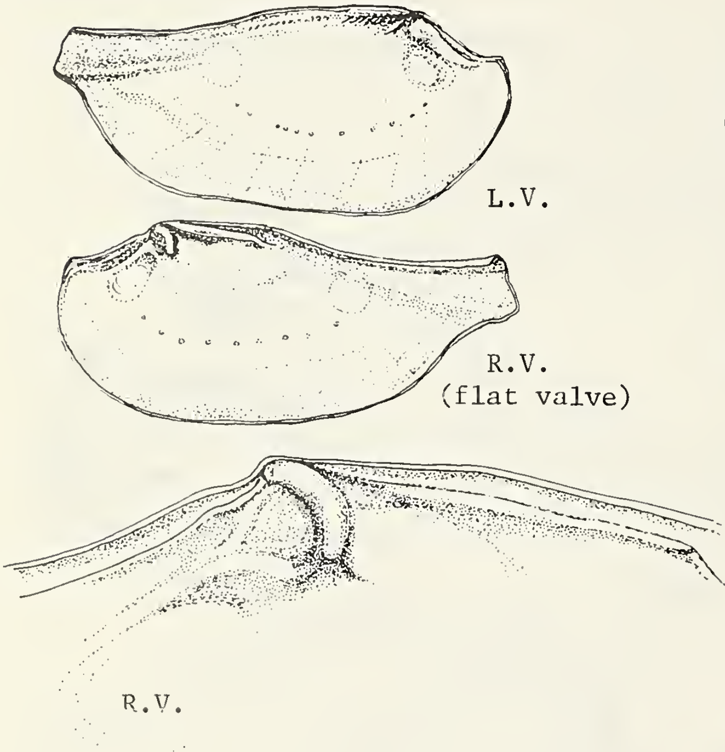

Figure 76. *Pandora brevifrons* Sowerby, 1835. Gemmell specimen (SDNHM 90076), 12.5 mm L, interior of valves and detail of hinge in right valve

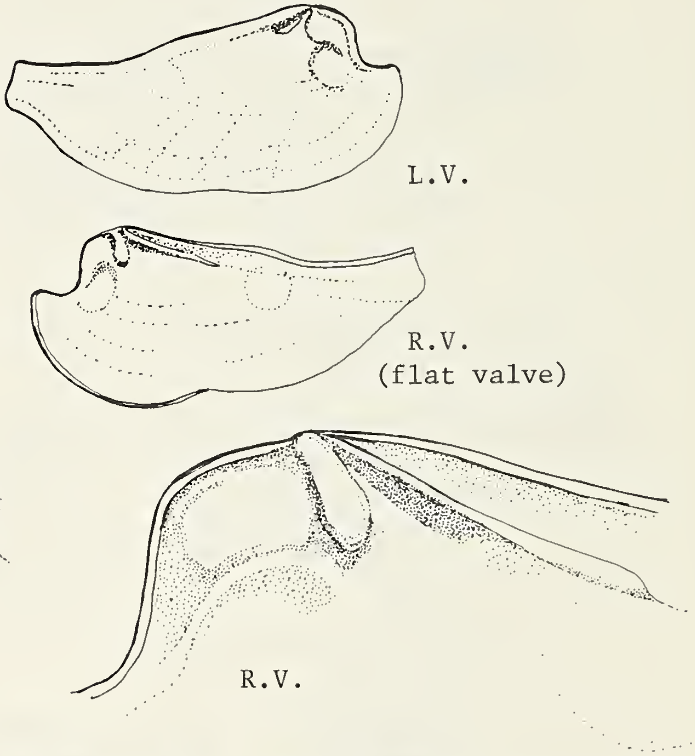

Figure 77. *Pandora uncifera* Pilsbry and Lowe, 1932. Gemmell specimen (SDNHM 90078), 11.1 mm L, interior of valves and detail of hinge in right valve

Pandora (Clidiophora) cornuta C.B. Adams, 1852

Ann. Lyceum Nat. Hist. NY:298 [Fig'd Turner (1955, pl. 17, figs. 14, 15)]

Synonym: *Pandora (Clidiophōra) acutedentata* (Carpenter, 1864c)

Figure references: Keen #738; Hertz, Myers and Gemmell (1985, fig. 9) and [Figure 78]

SDNHM 90079, 12 spec., 24.3-41.4 mm L, dredged live off Pta. Estrella

SDNHM 90080, 2 spec., 17-18 mm L, Bahía San Felipe, in drift on sand flats

SDNHM 90081, 2 spec., 4 and 11 mm L, from seastar stomachs, dredged, Chamizal I, Pta. Estrella and S for 35.4 km (22 mi.) [30°41'N to 30°51' 12"N and 114°32'W to 114°41'W] approx. 4.8 km (3 mi.) offshore in 9.1-18.3 m, in sand, 27 June 1968

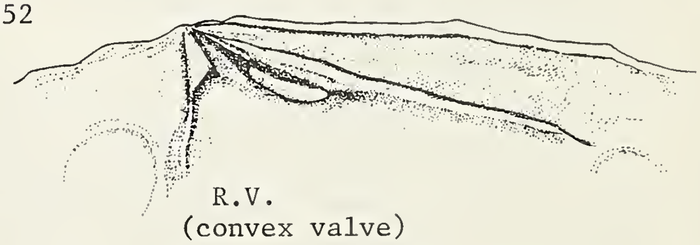

Figure 78. *Pandora (Clidiophora) cornuta* C.B. Adams, 1852. Holotype (MCZ 186309), 13.5 mm L, type locality: Panama; dentition in the right valve

Remarks: We observed that *P. (C.) cornuta* and *P. (C.) claviculata* (Carpenter, 1856), the type of *Clidiophora* Carpenter, 1864, orient in the opposite direction (anterior to posterior when lying on the inflated valve) from other Gulf of California pandorids examined (Hertz, Myers and Gemmell, 1985).

Distribution: Panama (Keen, 1971); (Bernard, 1983). Hertz, Myers and Gemmell (1985) extended the distribution from Panama to San Felipe.

LYONSIIDAE

Lyonsia californica Conrad, 1837

Jour. ANSP 7:248, pl. 19, fig. 20

Synonym: *Lyonsia gouldii* Dall, 1915b [new name for *Osteodesma nitidum* Gould, 1853 not *Mya nitida* Fabricius, 1798]

Figure reference: Keen #742 [as *Lyonsia gouldii* from Gould, 1853]

SDNHM 90082, 12 spec. and 21 v., 6-15 mm L, El Paraíso, in drift and on tide flats

SDNHM 90083, 12 spec. and 4 v., 7.6-13.8 mm L, from seastar stomachs, Bahía San Felipe, dredged in 15.2 m, 3.2 km (2 mi.) offshore, 1 Apr. 1973

SDNHM 90084, 3 spec. and 25 v., 7.4-15.4 mm L, San Luis Gonzaga, in drift

Remarks: Specimens collected by Gemmell and other SDNHM material from San José Del Cabo and Acapulco, Mexico and San Juan Del Sur, Nicaragua are considerably smaller and appear to be less inflated than SDNHM specimens from the west coast of southern California.

Distribution: Sitka, Alaska to Manuela Lagoon, central Baja California (McLean, 1978); 17N-55N (Bernard, 1983). Reported in the Gulf as *L. gouldii*: Puertecitos (DuShane, 1962); Guaymas (DuShane and Poorman, 1967); San Luis Gonzaga (DuShane and Sphon, 1968)

***Entodesma inflatum* (Conrad, 1837)

Jour. ANSP 7:248, pl. 19, fig. 10

Figure reference: Keen #744

SDNHM 90085, 2 spec., 33 and 34 mm L, 1.6 km (1 mi.) N of Coloradito, in nests in rocks, 19 Apr. 1969

SDNHM 90086, 7 spec., 12-23 mm L, 1.6 km (1 mi.) N of Coloradito, in drift

SDNHM 90087, 10 spec. and 4 v., 8-19 mm L, Bahía San Felipe to Playa Alicia, Mar. 1975

Remarks: Olsson (1961) and Bernard (1983) synonymized *E. inflatum* with *E. picta* (Sowerby, 1834). Olsson (1961) based his synonymy on a possible syntype of *picta* which had a plain light brown periostracum. Sowerby described *E. picta* as having a brown periostracum painted with undulating brown lines--"lineis nigris undulatis picta." We are retaining *E. inflatum* as did Keen (1971). See figure in Reeve (1875, *Mytilimeria*, pl. 1, species 6). The Gemmell specimens have a thin smooth periostracum with no brown lines.

Distribution: Puertecitos (DuShane, 1962); California to Guayaquil (Keen, 1971)

***Periploma* cf. *lagartilla* Olsson, 1961

Moll. Trop. E. Pac.:463-464, pl. 82, figs. 5-5b

Figure references: Keen #751 and [Figure 79]

SDNHM 90088, 4 spec. and 3 v., 15-20.4 mm L, N of Pta. San Felipe, dead on tide flats after storm, 12 Nov. 1968

SDNHM 90089, 4 spec. and 3 v., 17-22.5 mm L, Playa Alicia, on the reef at 5-6 ft. minus tides, Mar.-Apr. 1975

Remarks: The Gemmell specimens, collected dead, are fragile and worn. The exterior surface is translucent and smooth with the exception of some widely spaced glassy beads in a band close to the ventral margin on some valves. Though the general outline resembles *P. discus* Stearns, 1890, as well as *P. lagartilla*, the valves of *P. discus* are considerably larger (type=41 mm L) and densely and finely granulose. The Gemmell specimens are thin and reach a maximum length of 22.5 mm. Neither

P. lagartilla nor *P. discus* have been reported from San Felipe.
Distribution: Panama [type locality] (Keen, 1971); 8N (Bernard, 1983)

Periploma stearnsii Dall, 1896
Proc. USNM 18:19 [Fig'd Dall (1908: 43, pl. 16, fig. 5)]
Figure reference: Keen #754
SDNHM 90090, 1 spec., 35 mm L, 41.7 km (26 mi.) S of San Felipe, 9.7 km (6 mi.) S of Sulphur Mine, among rocks
SDNHM 90091, 1 spec. 18 mm L, Playa Alicia, dead
SDNHM 90092, 1 v., 30 mm L, San Luis Gonzaga, among rocks
Remarks: Surface is densely granulose with no apparent pattern visible under magnification.
Distribution: Pt. Fermin, California; the head of the Gulf to Cabo San Lucas, Baja California Sur (Keen, 1971); 23N-32N (Bernard, 1983)

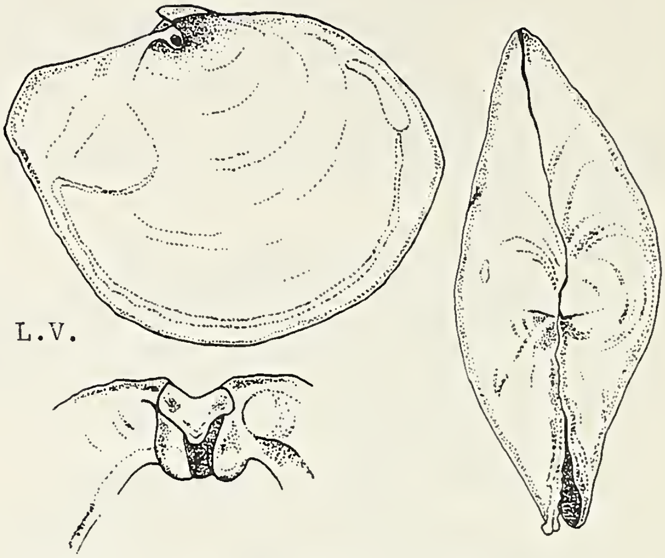

Figure 79. *Periploma* cf. *lagartilla* Olsson, 1961. Gemmell specimen (SDNHM 90088), 18 mm L, exterior and interior views with detail of hinge

Periploma planiusculum Sowerby, 1834
Proc. Zool. Soc. London for 1834:87
Synonym: *Periploma argentaria* Conrad, 1837
Figure reference: Keen #753
SDNHM 90093, 13 spec., 16-46.5 mm L, Bahía San Felipe, on tide flats, 29 Sept. 1966
SDNHM 90094, 20 v., 21.5-61.5 mm L, El Paraíso
Distribution: Guaymas (DuShane and Poorman, 1967); Southern California to Peru (Keen, 1971); 4S-34N (Bernard, 1983)

THRACIIDAE

Thracia curta Conrad, 1837
Jour. ANSP 7(2):248, pl. 19, fig. 8
Figure reference: Keen #760
SDNHM 90095, 3 spec. and 6 v., 24.2-44.3 mm L, San Luis Gonzaga, among rocks, Apr. 1967
Distribution: Alaska to Ecuador (Keen, 1971); 23N-45N (Bernard, 1983)

Cyathodonta undulata Conrad, 1849
Proc. ANSP 4:156
Synonym: *Cyathodonta undulata peruviana* Olsson, 1961
Figure reference: Keen #766
SDNHM 90096, 4 spec. and 9 v., 24-43.5 mm L, San Luis Gonzaga, dead on the beach
SDNHM 90097, 1 spec., 21.1 mm L, Playa Alicia, dead with body, in drift, 1967
Distribution: Puerto Peñasco to Peru (Keen, 1971); 4S-31N (Bernard, 1983)

CUSPIDARIIDAE

Cardiomya costata (Sowerby, 1834)
Proc. Zool. Soc. London for 1834:87
Synonym: *Cuspidaria dulcis* Pilsbry and Lowe, 1932

Figure reference: Keen #777

SDNHM 90098, 2 v., 7 and 8 mm L, dredged, Chamizal II, inside Bahía Gonzaga S of Isla Willard [29°47'18"N; 114°22'42"W] 91.5 m offshore in 9.1 m, in fine sand, 8-10 July 1969

SDNHM 90099, 1 v., 5 mm L, dredged Chamizal II, W of Isla San Luis [29°57'48"N; 114°28'00"W]0.8 km (0.5 mi.) offshore in 25.6 m, in sand and pumice, 8-10 July, 1969

Remarks: For further discussion see Bernard (1974)

Distribution: Southern California to N Gulf to Ecuador and Galapagos Is. (also in western Atlantic) (Keen, 1971); 1S-34N (Bernard, 1983)

Cardiomya didyma (Hinds, 1843b)

Proc. Zool. Soc. London:78 [Fig'd Hinds(1845, pl. 20, fig. 19)]

Figure references: Keen #778 and Bernard (1974, pl. 15, fig. 3)

SDNHM 90100, 3 spec. and 2 v., 5-8 mm L, San Felipe, S of Playa Blanca, in drift, Nov. 1968

Remarks: Bernard (1974) figured a specimen from SDNHM (#4187, now #82824) as a possible neotype. For further discussion of this species see Bernard (1974).

Distribution: Northern Gulf to Panama (Keen, 1971); 9N-30N (Bernard, 1983)

LITERATURE CITED

AAASC. Automobile Club of Southern California.
1985. Baja Calif. Los Angeles. 132 pp., illus.

ABBOTT, R. T.
1974. American seashells, 2nd ed. Van Nostrand Reinhold Co., N.Y. 663 pp., 24 pls., ca. 6400 text figs.

ADAMS, A.
1850. Description of new species of the genus *Cumingia*, with some additional generic characters. Proc. Zool. Soc. London for 1850:24-25, pl. 8

ADAMS, C. B.
1852. Catalogue of shells collected at Panama with notes on their synonomy, station and geographical distribution. Ann. Lyceum Nat. Hist. N.Y. 5:229-549 [549 unnumbered]

ADAMS, H. and A.
1854. Description of a new genus of bivalve Mollusca. Ann. Mag. Nat. Hist. ser. 2. 14:418

AFSHAR, F.
1969. Taxonomic revision of the superspecific groups of the Cretaceous and Cenozoic Tellinidae. Geol. Soc. America, Mem. 119:215 pp., 45 pls.

AGUAYO, C. G.
1943. Centenario de los "Moluscos" de Orbigny en la obra de la Sagra. Revista Soc. Malacologica Cuba 1:37-40

ALLEN, J. A.
1968. The functional morphology of *Crassinella mactracea* (Linsley) (Bivalvia:Astartacea). Proc. Malac. Soc. London 38(1):27-40, 5 text figs.

ANTON, H. E.
1837. Diagnosen einiger neuen Conchylien-Arten. Arch. f. Naturg. 3(1):281-288

ARNOLD, R.
1906. The Tertiary and Quaternary pectens of California. U.S. Geol. Survey, Prof. Paper #47, 264 pp., 53 pls.

BAILY, J. L.
1935. The first conchologist. Nautilus 48(3):73-75

BERNARD, F. R.
1974. Septibranchs of the eastern Pacific (Bivalvia Anomalodesmata). Allan Hancock Monog. Mar. Biol. 8:1-279, 33 pls., 42 tables
1983. Catalogue of the living Bivalvia of the eastern Pacific Ocean: Bering Strait to Cape Horn. Canadian Sp. Pub. Fish. and Aq. Sci. 61. 102 pp.

BERRY, S. S.
1957. Notices of new eastern Pacific Mollusca - I. Leaflets in Malac. vol. 1(14):75-82
1959. Notices of new eastern Pacific Mollusca - III. Leaflets in Malac. vol. 1(18):107-113

BOSS, K. J.
1966. The subfamily Tellininae in the western Atlantic. Parts I and II. Johnsonia 4(45, 46):217-344, pls. 127-163

BRANN, D. C.
1966. Illustrations to "Catalogue of the Collection of Mazatlan Shells" by Philip P. Carpenter. Paleo. Res. Inst., Ithaca, N.Y. 111 pp., 60 pls.

BRETSKY, S. S.
1976. Evolution and classification of the Lucinidae (Mollusca: Bivalvia). Paleontographica Amer. 8(50):219-337, pls. 25-36

BRODERIP, W. J.
1832. Characters of new species of Mollusca and Conchifera, collected by Mr. Cuming on the western coast of South America and in the islands of the south Pacific Ocean. Proc. Zool. Soc. London for 1832: 50-61, 124-126
1835a. Description of some species of *Chama*. Proc. Zool. Soc. London for 1834:148-151
1835b. Characters of new genera and species of Mollusca and Conchifera, collected by Mr. Cuming. Proc. Zool. Soc. London for 1835:41-47

BRODERIP, W. J. and G. B. SOWERBY.
1829. Observations on new or interesting Mollusca contained, for the most part, in the Museum of the Zoological Society. Zool. Jour. London 4:359-379, pl. 9

BRUSCA, R. C.
1980. Common intertidal invertebrates of the Gulf of California. Univ. of Ariz. Press, 513 pp., 14 pls., text figs.

CARPENTER, P. P.
1856a. Description of new species of shells collected by Mr. T. Bridges in the Bay of Panama ... collection of Hugh Cuming, Esq. Proc. Zool. Soc. London for 1856:159-166
1856b. Description of shells from the Gulf of California and the Pacific coast of Mexico and California, Pt. II. Proc. Zool. Soc. London for 1856;198-229
1857. Catalogue of the collection of Mazatlan shells in the British Museum: collected by Frederick Reigen. London. 552 pp.
1864a. Diagnoses of new forms of mollusks collected at Cape San Lucas, Lower California, by Mr. J. Xantus. Ann. Mag. Nat. Hist. ser. 3. 13:311-312
1864b. Supplementary report on the present state of our knowledge with regard to the Mollusca of the west coast of North America. Brit. Assoc. Adv. Sci. Rpt. for 1863;517-686
1864c. Contributions towards a monograph of the Pandoridae. Proc. Zool. Soc. London: 596-603

CHAVAN, A.
1937. Essai critique de classification des Lucines. Jour. de Conchyl. 81:198-216, 5 text figs.
1969. In Treatise on Invert. Paleo., R. C. Moore, Ed. Mollusca 6 - Bivalvia Pt. N, 2:491-518

CLESSIN, S.
1888. In Kuster and Kobelt, 1837-1906. Systematisches Conchylien Cabinet von Martini und Chemnitz. Solenaceen: 106 pp., 25 pls. [not seen, fide Bernard (1983)]

COAN, E. V.
1965. Kitchen midden mollusks of San Luis Gonzaga Bay. Veliger 7(4):216-218, pl. 28
1968. A biological survey of Bahia de los Angeles, Gulf of California, Mexico III. Benthic Mollusca. Trans. S.D. Soc. Nat. Hist. 15(8):108-132
1971. The northwest American Tellinidae. Veliger, Supp. 14:1-63, 69 figs.
1973a. The northwest American Semelidae. Veliger 15(4):314-329, 19 figs.
1973b. The northwest American Psammobiidae. Veliger 16(1):40-57, 4 pls. 8 text figs.
1973c. The northwest American Donacidae. Veliger 16(2):130-139, 1 pl. 2 text figs.
1979. Recent eastern Pacific species of the crassatellid bivalve genus *Crassinella*. Veliger 22(1):1-11, 22 figs.
1983. The eastern Pacific Donacidae. Veliger 25(4):273-298, 38 figs.
1984. The Recent Crassatellinae of the eastern Pacific, with some notes on *Crassinella*. Veliger 26(3):153-169, figs. 1-16

CONRAD, T. A.
1837. Descriptions of marine shells from Upper California collected by Thomas Nuttall, Esq. J. Acad. Nat. Sci. Phil. 7(2):227-268, pls. 17-20
1838. Foss. Med. Tert. U.S. (1), II - Moll. [not seen]
1848. Fossil shells from Tertiary deposits on the Columbia River, near Astoria. Amer. Jour. of Sci. ser. 2, 5(15):432-433
1849. The following new and interesting shells are from the coasts of Lower California and Peru and were presented to the Academy by Dr. Thomas B. Wilson. Proc. Acad. Nat. Sci. Phil. 4:155-156
1867. Descriptions of new west coast shells. Am. Jour. of Conch. 3(2):192-193
1869. Notes on Recent Mollusca. Amer. Jour. Conch. 5(2):104-108, pls. 10-13

DALL, W. H.
1890. Scientific results of explorations by the U.S. Fish Commission steamer Albatross. No. VII. Preliminary report on the collection of Mollusca and Brachiopoda obtained in 1887-88. Proc. U.S. Nat. Mus. for 1889, 12:219-362, pls. 5-14
1894. On some species of *Mulinia* from the Pacific coast. Nautilus 8(1):5-6, pl. 1
1896. Diagnoses of new species of mollusks from the west coast of America. Proc. U.S. Nat. Mus. 18:7-20
1897. New west American shells. Nautilus 11(8):85-86
1898. Contributions to the Tertiary fauna of Florida ... Trans. Wagner Free Inst. Sci. 3(4):571-947, pls. 23-35
1899a. Synopsis of the American species of the family Diplodontidae. Jour. Conch. 9(8):244-246
1899b. Synopsis of the Solenidae of North America and the Antilles. Proc. U.S. Nat. Mus. 22:107-112
1900a. Synopsis of the family Tellinidae and of the North American species. Proc. U.S. Nat. Mus. 23:285-326, pls. 2-4
1900b. Contributions to the Tertiary fauna of Florida ... Trans. Wagner Free Inst. Sci. 3(5):949-1189, pls. 46-47
1901. Synopsis of the Lucinacea and of the American species. Proc. U.S. Nat. Mus. 23:779-883, pls. 39-42
1902a. New species of Pacific coast shells. Nautilus 16(4):43-44
1902b. Synopsis of the family Veneridae and of the North American Recent species. Proc. U.S. Nat. Mus. 26:335-412, pls. 12-16
1903. Synopsis of the Carditacea and of the American species. Proc. Acad. Nat. Sci. Phil. 54:696-716

1908. Reports on the dredging operations off the west coast of Central America to the Galapagos, to the west coast of Mexico and in the Gulf of California... XIV. The Mollusca and Brachiopoda. Bull. Mus. Comp. Zool. Harvard 43(6):205-487, pls. 1-22

1909. Report on a collection of shells from Peru with a summary of the littoral marine Mollusca of the Peruvian Zoological province. Proc. U.S. Nat. Mus. 37:147-294, pls. 20-28

1912. New Californian Mollusca. Nautilus 25(11):127-129

1913. Diagnoses of new shells from the Pacific Ocean. Proc. U.S. Nat. Mus. 45:587-597

1914. Notes on some west American pectens. Nautilus 27(11):121-122

1915a. Notes on the Semelidae of the west coast of America including some new species. Proc. Acad. Nat. Sci. Phil. 67:25-28

1915b. A review of some bivalve shells of the group Anatinacea from the west coast of America. Proc. U.S. Nat. Mus. 49:441-456

1916. Diagnoses of new species of marine bivalve mollusks from the northwest coast of America in the collection of the United States National Museum. Proc. U.S. Nat. Mus. 52:393-417

1925. Illustrations of unfigured types of shells in the collection of the United States National Museum. Proc. U.S. Nat. Mus. 66(17):1-41, pls. 1-36

DALL, W. H. and W. H. OCHSNER.

1928. Tertiary and Pleistocene Mollusca from the Galapagos Islands. Proc. Calif. Acad. Sci., ser. 4, 17(4):89-139, pls. 2-7, 5 text figs.

DELESSERT, B.

1841. Recueil de coquilles décrites par Lamarck dans son Histoire naturelle des animaux san vertebres et non encore figurées. Paris. 94 pp., 40 pls.

DESHAYES, G. P.

1836. In Lamarck Histoire naturelle des animaux sans vertebres, 2nd ed., vol. 7. Paris

1839. Rev. Zool. (Soc. Cuv.) II [not seen]

1843. Magasin de Zool. (2) V [not seen]

1854. Descriptions of new species of shells from the collection of Hugh Cuming, Esq. Proc. Zool. Soc. London for 1854;62-72

1855. Descriptions of new shells from the collection of Hugh Cuming, Esq. Proc. Zool. Soc. London for 1854:321-371

DILLWYN, L. W.

1817. A descriptive catalogue of Recent shells arranged according to the Linnaean method; with particular attention to the synonomy. London. vol. 1, 580 pp.

DOLLFUS, G. F. and P. DAUTZENBERG

1920. Mem. Soc. Geol. France. Paleont. Mem. 27:471 [not seen]

DUNKER, G.

1852. Aviculacea nova. Zeitschr. f. Malakozool. 9:73-80 [not seen]

1857. Mytilacea nova collectione Cumingianae discripta a Guilermo Dunker. Proc. Zool. London for 1856:358-366

1862. Solenacea Nova Collectionis Cumingianae. Proc. Zool. Soc. London for 1861:418-427

DURHAM, J. W.

1950. 1940 E. W. Scripps Cruise to the Gulf of California. Part II, megascopic paleontology and marine stratigraphy. Geol. Soc. Amer. Mem. 43, pp. 1-216, pls. 1-48

DUSHANE, H.

1962. A checklist of mollusks for Puertecitos, Baja California, Mexico. Veliger 5(1):39-50

DUSHANE, H. and E. BRENNAN.

1969. A preliminary survey of mollusks for Consag Rock and adjacent areas, Gulf of California, Mexico. Veliger 11(4):351-363

DUSHANE, H. and R. POORMAN

1967. A checklist of mollusks for Guaymas, Sonora, Mexico. Veliger 9(4):413-441

DUSHANE, H. and G. G. SPHON

1968. A checklist of intertidal mollusks for Bahia Willard and the southwestern portion of Bahia San Luis Gonzaga, State of Baja California, Mexico. Veliger 10(3):233-246

EMERSON, W. K.

1958. Results of the Puritan-American Museum of Natural History expedition to western Mexico. 1. General account. Amer. Mus. Novit. #1894:1-25, 9 figs.

EMERSON, W. K. and E. L. PUFFER.

1957. Recent mollusks of the 1940 E. W. Scripps cruise to the Gulf of California. Amer. Mus. Nov. #1825; 57 pp., 1 fig.

FISCHER, P.

1880-1887. Manuel de Conchyliologie ... Paris. 1369 pp., 23 pls., 1138 text figs.

FRASER, C. M.

1943. General account of the scientific work of the Velero III in the eastern Pacific 1931-41. Pt. III. Allan Hancock Pacific Exped. 1(3):259-431

GABB, W. M.

1866. Cretaceous and Tertiary fossils. Geol. Surv. Calif., Paleo. 2. Moll. 299 pp., 36 pls.

GEMMELL, J.

1968. Dredging trip on the "Chamizal" out of San Felipe. News West. Assoc. of Shell Clubs 9(4):D-20 to D-22

1969. Dredging by shrimp boat. News West. Assoc. of Shell Clubs 10(4):D-15 to D-17

1973a. Field observations on gastropod breeding and egg-laying. Festivus 4(5):32-34

1973b. Observations on *Nassarius moestus* (Hinds, 1844) from San Felipe, Baja California, Mexico. Festivus 4(8):56-57

1974. Notes on egg capsules and larval development of *Typhis clarki* Keen and Campbell, 1964. Festivus 5(3):100-103

GEMMELL, J., C. M. HERTZ and B. W. MYERS.
1980. Seastar predation on mollusks in the San Felipe Bay area, Baja California, Mexico. Festivus 7(3): 24-55, 51 figs.
1985. A problem oyster in the Gulf of California, *"Ostrea" quercinus* Sowerby, 1871, rediscovered. Festivus 17(5):43-48, 8 figs.
GEMMELL, J., B. W. MYERS and C. M. HERTZ.
1979. Solemyidae: clarification of two species in the subgenus *Petrasma*. Festivus 11(9):73-76, 5 figs.
1981. A report on the faunal study of the Gemmell collection from San Felipe, Baja California, Mexico, from 1965 to 1976. Festivus 13(8):87-93, 10 figs.
1983. Observations on *Tellina coani* Keen, 1971. Festivus 15(10):103-104, 5 figs.
1984. Observations on *Macoma siliqua* (C. B. Adams, 1852) Bivalvia:Tellinidae. Festivus 16(5):54-62, 14 figs.
GMELIN, J. F.
1791. Systema naturae ... 13 ed., 1(6) Vermes:3021-3910. Leipzig
GOULD, A. A.
1851. Description of a number of California shells collected by Major William Rich and Lieutenant Thomas P. Green. Proc. Boston Soc. Nat. Hist. 4:87-93 [not seen]
1853. Descriptions of shells from the Gulf of California and the Pacific coasts of Mexico and California. Boston Jour. Nat. Hist. 6(24):374-405, pls. 14-16
GRANT, U. S., IV and H. R. GALE
1931. Catalogue of the marine Pliocene and the Pleistocene Mollusca of California and adjacent regions. Mem. San Diego Soc. Nat. Hist. 1036 pp., 32 pls.
GRAU, G.
1959. Pectinidae of the eastern Pacific. Allan Hancock Pacific Exped. 23, 308 pp., 57 pls.
GRAY, J. E.
1838. Catalogue of the species of the genus *Cytherea* of Lamarck with the description of some new genera and species. Analyst 8:302-309
1850. On the species of Anomiadae. Proc. Zool. Soc. London for 1849:113-124, pl. 1
HANLEY, S. C. T.
1842-1856. An illustrated and descriptive catalogue of Recent bivalve shells. London. Supp., 24 pp., pls. 9-24
1844a. Description of new species of Mytilacea ... Proc. Zool. Soc. London for 1843:14-17
1844b. Descriptions of new species of the genus *Tellina* chiefly collected by H. Cuming, Esq., in the Philippine Islands and Central America. Proc. Zool. London for 1844:59-64, 68-72, 147-149
1845. Descriptions of six new species of *Donax*, in the collection of Hugh Cuming. Proc. Zool. Soc. London for 1845:14-16
HARRY, H. W.
1966. Studies on bivalve mollusks of the genus *Crassinella* in the northwestern Gulf of Mexico: anatomy, ecology and systematics. Inst. Mar. Sci. Publ. 11:65-89, 17 text figs.
1969. A review of the living leptonacean bivalves of the genus *Aligena*. Veliger 11(3):164-181, 40 figs.
1985. Synopsis of the supraspecific classification of living oysters (Bivalvia:Gryphaeidae and Ostreidae). Veliger 28(2):121-158, 30 figs.
HERTZ, C. M., Ed.
1976. *Bornia chiclaya* Olsson, 1961 in San Felipe. Festivus 7(2):11, 2 figs.
1984. Illustration of the types named by S. Stillman Berry in his "Leaflets in Malacology." Festivus vol. 15: Supp. [Jan. 1984], 42 pp., 92 figs.
HERTZ, C. M., J. GEMMELL and B. W. MYERS.
1982. A review of *Chama buddiana* C. B. Adams, 1852 (Bivalvia:Chamidae). Festivus 14(2):15-24, 23 figs.
HERTZ, C. M., B. W. MYERS and J. GEMMELL
1982. The distribution of *Diplodonta orbellus* (Gould, 1851) and a diagnosis of *Diplodonta subquadrata* (Carpenter, 1856) (Bivalvia:Ungulinidae). Festivus 14(7):76-87, 14 figs.
1984. A comparison of two related species of *Tellina: Tellina hiberna* Hanley, 1844 and *Tellina amianta* Dall, 1900. Festivus 16(3):28-34, 15 figs.
1985. *Pandora (Clidiophora) cornuta* C. B. Adams, 1852 and new information on its distribution. Festivus 17(10):101-110, 11 figs.
HERTZ, J.
1980. *Modiolus capax* (Conrad, 1837). Festivus 12(11):135
HERTLEIN, L. G.
1968. *Tellina ulloana*, a new species from Magdalena Bay, Baja California, Mexico. Veliger 11(1):80
HERTLEIN, L. G. and U. S. GRANT, IV.
1972. The geology and paleontology of the marine Pliocene of San Diego, California (Paleontology:Pelecypoda). Mem. San Diego Soc. Nat. Hist. 2 (pt. 2B), 409 pp., 57 pls.
HERTLEIN, L. G. and A. M. STRONG
1946-1949. Eastern Pacific expeditions of the New York Zoological Society. Mollusks from the west coast of Mexico and Central America. Pts. III-VIII Zoologica, N.Y., pt. 3, vol. 31:53-76, pl. 1 (Aug. 20, 1946); pt. 5, vol. 31:129-150, pl. 1 (Feb. 21, 1947); pt. 6, vol. 33:163-198, pls. 1, 2 (Dec. 31, 1948); pt. 7, vol. 34:63-97, pl. 1 (Aug. 10, 1949); pt. 9, vol. 35:217-252, pls. 1, 2 (Aug. 20. 1951)
HINDS, R. B.
1843a. On new species of *Corbula* and *Potamomya*. Proc. Zool. Soc. London:55-59
1843b. Descriptions of new species of *Neaera*. Proc. Zool. Soc. London 75-79
1843c. Descriptions of new species of *Nucula* from the collections of Sir Edward Belcher, C. B., and Hugh Cuming, Esq. Proc. Zool. Soc. London 97-101
1844-45. The zoology of the voyage of H.M.S. Sulphur, under the command of Capt. Sir Edward Belcher ... during 1836-1842. Mollusca II. London, 72 pp., 21 pls.
HOWARD, FAYE B.
1986. (posthumous). Collecting at and around San Felipe, Baja California, Mexico. Festivus. 18(9):130-134
HUEY, L. M.
1926. unpublished handwritten diary. Archives, San Diego Nat. Hist. Mus.

1953. Fisher folk of the Sea of Cortes. Pacific Discovery 6(1):8-13

ICZN International Code of Zoological Nomenclature
1985. #3rd Edition, U.C. Press, Berkeley, 338 pp., (French and English)
IREDALE, T.
1930. Queensland molluscan notes #2. Mem. Queensland Mus. 9:73-88, pl. 9, 18 figs.
1939. British Museum (Natural History) Great Barrier Reef Expedition 1928-29. Sci. Repts. V(6) Mollusca. Part I, 425 pp., 7 pls.
JOHNSON, W. W.
1985. Baja California. Time-Life Books, Virginia, 184 pp., illus.
KEEN, A. M.
1958a. New mollusks from tropical west America. Bull. Amer. Paleo. 38(172):239-255
1958b. Sea shells of tropical west America. Stanford Univ. Press, 624 pp., 1700 figs.
1966. West American mollusk types at the British Museum (Nat. Hist.) III. Alcide D'Orbigny's South American Collection. Veliger 9(1):1-7, pl. 1
1968. West American mollusk types at the British Museum (Nat. Hist.) IV. Carpenter's Mazatlan collection. Veliger 10(4):389-439, pls. 55-59, 171 text figs.
1971. Sea Shells of tropical west America. 2nd ed. Stanford Univ. Press. 1064 pp., 22 pls., ca 4000 text figs.
KEEN, A. M. and E. V. COAN
1975. Sea shells of tropical west America: Additions and corrections to 1975. West. Soc. of Malac., Occas. Paper 1, 66 pp.
KING, P. P. and W. J. BRODERIP
1832. Description of the Cirrhipeda, Conchifera and Mollusca ... H.M.S. Adventure and Beagle ... 1826-1830 ... Zool. Jour. 5:332-349
KLEEMANN, K. H.
1983. Catalogue of Recent and fossil *Lithophaga* (Bivalvia). Jour. Moll. Stud., Supp. 12, 46 pp.
LAMARCK, J. B. P. A. de M. de.
1819. Histoire naturelle des animaux san vertebres. Paris. 6(1):252
LAMY, E.
1930. Revision des Limidae vivants du Museum National D'Histoire Naturelle de Paris. Jour. de Conchyl. 74(3):169-198
1934. Coquilles marines recueillies par M. E. Aubert de la Rue dans l'Amerique de Sud. Bull. Mus. Nat. Hist. Paris. ser. 2, 6:432-435, 1 fig.
LEWIS, L. R. and P. E. EBELING
1971. Sea guide. Vol. II. Baja. Covering the waters of Baja California from San Diego to Cabo San Lucas to San Felipe including all the offshore and oceanic islands. 368 pp., 79 maps, 286 illus.
LI, C. C.
1930. The Miocene and Recent Mollusca of Panama Bay. Bull. Geol. Soc. China, 9:249-296, pls. 1-8 [not seen] See H. A. Pilsbry (1931) summary of species collected
LINNAEUS, C.
1767. Systema naturae per regna tria naturae. Editio duodecima reformata. Stockholm, vol. 1, Regnum animale. pt. 2, pp. 533-1327
LOWE, H. N.
1933. At the head of the gulf of California. Nautilus 47(2):45-47
1935. New marine Mollusca from west Mexico together with a list of shells collected at Punta Penasco, Sonora, Mexico. Trans. S.D. Soc. Nat. Hist. 8(6):15-34, pls. 1-4
MABILLE, J.
1895. Mollusques de la basse Californie recueillis par M. Diguet. Bull. Soc. Philom. Paris, ser. 8 (7):54-76
MALUF, L. Y.
1983. Physical oceanography, pp. 26-45, figs. 3.2-3.7. In Case, T. J. and M. L. Cody. Island biogeography in the Sea of Cortez. 341 pp., 11 pls., text figs. 1.1-12.3, tables 2.1-12.3. Appendix 345-508, figs. 3.1-10.11
McLEAN, J. H.
1978. Marine shells of southern California. Nat. Hist. Mus. L.A. Co. Sci. ser. 24, rev. ed., 104 pp., 54 figs.
MEIGS, P.
1939. The Kiliwa Indians of Lower California. Ibero-Americana 15. Univ. Calif. Press, Berkeley, CA. p. 27
MENKE, K. T.
1848. Einige neue, theils neuhollandische und mexikanische Mytilaceen meiner Sammlung. Zeitschr. f. Malakozool. Funfter Jahrgang pp. 1-6
MOLINA, G. I.
1782. Saggio sulla storia naturale dei Chile. 367 pp., 1 map [not seen]
MONTAGU, G.
1803-1808. Testacea Britannica: or an account of all the shells hitherto discovered in Britain. London. 2 vols., 606 pp., 16 pls., Supp., 183 pp., pls. 17-30
MÖRCH, O. A. L.
1853. Catalogus conchyliorum quae reliquit D. Alphonso D'Aguirra et Gadea Comes de Yoldi. Copenhagen. Fasc. 2 [Pelecypoda, etc.], 74 pp.
1860-1861. Beiträge zur Molluskenfauna Central Amerika's. Malakozool. Blätter 6(4):170-192 (1860); 7(5):193-213 (1861)
MORTON, B.
1981. The Anomalodesmata. Malacologia 21(1-2):35-60, 17 figs.

MÜHLFELD, M. VON
1811. Ges. Nat. Fr. Berlin, Mag. 5 (1) [not seen]
MYERS, B. W. and A. D'ATTILIO
1979. Range extension for *Isognomon janus* Carpenter, 1857 (Bivalvia). Festivus 11(10):79-81, 2 figs.
MYERS, B. W., J. GEMMELL and C. M. HERTZ
1983. Is there a *Tellina reclusa* or is *Tellina brevirostris* a variable species? Festivus 15(8):81-87, 12 figs.
1984. Examination of *Gari helenae* Olsson, 1961 and redescription of the hinge/ligament. Festivus 16(2):20-25, 14 figs.
NELSON, E. W.
1911. A land of drought and desert: Lower California. Nat'l. Geographic 22:443-474, illus.
1921. Lower California and its natural resources. Nat. Acad. Sci. 16, First Memoir, 194 pp., 35 pls.
NORTH, A. W.
1908. The mother of California. Paul Elder & Co., San Francisco. 169 pp.
NYST, P. H.
1848. Tableau synoptique et synonymique des especes viviantes et fossiles de la famille des Arcacées. Pt. 1, Genre *Arca*. Mem. Acad. Roy. Sci. Lett. Beaux-Arts Belgique. 22:1-79
OLSSON, A. A.
1961. Mollusks of the tropical eastern Pacific ... Panamic-Pacific Pelecypoda. Paleo. Res. Inst. Ithaca, N.Y. 574 pp., 86 pls.
OLSSON, A. A. and A. HARBISON
1953. Pliocene Mollusca of southern Florida. Acad. Nat. Sci. Phil., Monog. #8, 361 pp., 15 pls.
ORBIGNY, A. d'.
1834-1847. Voyage dans l'Amérique Méridionale Mollusques. Paris. vol. 5, pt. 3 [not seen]
1842. Mollusques: In Sagra, Histoire physique, politique et naturelle de l'Ile de Cuba. Atlas pl. 27, figs. 56-59 [not seen]
PALMER, K. V. W.
1958. Type specimens of marine Mollusca described by P. P. Carpenter from the west coast (San Diego to British Columbia). Geol. Soc. Amer. Mem. 76, 376 pp., 35 pls.
PARKER, P.
1949. Fossil and Recent species of the pelecypod genera *Chione* and *Securella* from the Pacific Coast. Jour. Paleont. 23(6):577-593, pls. 89-95
PHILIPPI, R. A.
1836. Arch. f. Naturg. II (1) [not seen]
1846. Diagnosen einiger neuer Conchylien-arten. Zeits. f. Malak. 3(1):19-24
1847. Abbild. und Beschreib ... Conchylien Cassel, vol. 2, text and 43 pls.
PILSBRY, H. A.
1931. The Miocene and Recent Mollusca of Panama Bay. Proc. Acad. Nat. Sci. Phil. 83:427-440
PILSBRY, H. A. and H. N. LOWE
1932. West Mexican and Central American mollusks collected by H. N. Lowe, 1929-1931. Proc. Acad. Nat. Sci. Phil. 84:33-144, 17 pls., 7 text figs.
PILSBRY, H. A. and A. OLSSON.
1941. A Pliocene fauna from western Ecuador. Proc. Acad. Nat. Sci. Phil. 93:1-79, 19 pls.
PILSBRY, H. A. and W. J. RAYMOND
1898. Note on *Septifer bifurcatus* Conrad. Nautilus 12:69-71
PILSBRY, H. A. and E. G. VANATTA
1902. Papers from the Hopkins Stanford Galapagos Expedition 1898-1899. Proc. Wash. Acad. Sci. 4:549-560, pl. 35
RÉCLUZ, C. A.
1842. Description de deux coquilles nouvelles. Rev. Zool. Soc. Cuvierienne 5:305-337
REEVE, L. A.
1843. Descriptions of various new shells about to be figured in the Conchologia Iconica. Proc. Zool. Soc. London for 1843:31-34
1843-1878. Conchologia Iconica: or, illustrations of the shells of molluscous animals. vols. 1-20 [continued by G. B. Sowerby II, vols. 15-20]
REINHART, P. W.
1937. Three new species of the pelecypod family Arcidae from the Pliocene of California. Jour. Paleo. 11(3):181-185, pl. 28
1943. Mesozoic and Cenozoic Arcidae from the Pacific slope of North America. Spec. Paper, Geol. Soc. Amer. #47: 117 pp., 15 pls.
REYNELL, A.
1910. Further notes on the dates of issue of the parts of Sowerby's Conchological Illustrations. Proc. Malac. Soc. London 9:212-213
ROBINSON, M. K.
1973. Atlas of monthly mean sea surface temperatures in the Gulf of California. S.D. Nat. Hist. Mus. Mem. 5, 97 pp., 90 figs.
ROCHEBRUNE, A.-T. de
1895. Diagnoses de mollusques nouveaux, provenant du voyage de M. Diguet en Basse-Californie. Bull. Mus. Hist. Nat. Paris 1:239-243 [not seen]
RÖDING, P. F.
1798. Museum Boltenianum ... pars secunda continens Conchylia. Hamburg. 109 pp.
SALISBURY, A. E.
1934. On the nomenclature of Tellinidae with descriptions of new species and some remarks on distribution. Proc. Malac. Soc. London 21(2):74-91, pls. 9-14

SAY, T.
1825. On a new species of *Modiola*. Jour. Acad. Nat. Sci. Phil. 4(2):368-370
1831. American Conchology, or descriptions of the shells of North America. New Harmony, Indiana. pt. 3 [not seen]
SCHENCK, W. E. and E. W. GIFFORD
1952. Archeology sites on opposite shores of the Gulf of California. Am. Antiquity 17(3):265
SCHUMACHER, C. F.
1817. Essai d'un nouveau système des habitations des vers testacés. Copenhagen. 287 pp., 22 pls.
SHELDON, P.
1922. In C. J. Maury, the Recent arcas of the Panamic Province. Paleontographica Amer. 1(4):63-208, pls. 29-31
SHERBORN, C. D.
1899. A note on the date of the parts of 'Humboldt and Bonpland' Voyage: Observations of Zoologie. Ann. Mag. Nat. Hist. ser. 7, 3:428
1922-1932. Index animalium, ser. 1, 1 vol.; ser. 2, 9 vols.
SOOT-RYEN, T.
1955. A report on the family Mytilidae. Allan Hancock Pacific Exped. 20, 175 pp., 10 pls., 65 text figs.
SOWERBY, G. B.
1825. Catalogue of the shells contained in the collection of the late Earl of Tankerville. London. 92 pp., Appendix 34 pp., 9 pls.
1832-33. Characters of new species of Mollusca and Conchifera collected by Hugh Cuming. Proc. Zool. Soc. London for 1832:50-61, 194-202
1833. Characters of new species of Mollusca and Conchifera collected by Hugh Cuming. Proc. Zool. Soc. London for 1833: 16-22, 34-38, 82-85
1834. Characters of new Mollusca and Conchifera collected by Hugh Cuming. Proc. Zool. Soc. London for 1834: 21-22, 46-49, 68-72, 87-89
1835. Characters of and observations on new genera and species of Mollusca and Conchifera collected by Mr. Cuming. Proc. Zool. Soc. London for 1835:21-23, 41-47, 84-85, 93-96, 109-110
SOWERBY, G. B., Jr.
1832-1841. The Conchological Illustrations. London. pts. 1-200, pls. 1-200
1841. On some new species of the genus *Cardium*, chiefly from the collection of H. Cuming, Esq. Proc. Zool. Soc. London for 1840:105-111
SOWERBY, G. B., II and III.
1842-1886. Thesaurus conchyliorum or monographs of genera of shells, edited by G. B. Sowerby, II, completed by G. B. Sowerby III, vols. 1-5. London
SOWERBY, G. B., II
1865-1878. [cont. of Reeve] Conchologia Iconica or illustrations of the shells of molluscous animals. vols. 15-20
SPENGLER, L.
1798. Over det toskallede slaegt tellinerne. Skr. Nat. Selsk. Copenhagen. 4(2):67-127, pl. 12
STEARNS, R. E. C.
1871. Preliminary descriptions of new species of marine Mollusca from the west coast of North America. Conch. Memo. #7, 2 pp.
1890. Descriptions of new west American land, fresh water and marine shells, etc. Scientific results of explorations by the U.S. Fish Commission ship Albatross. Proc. U.S. Nat. Mus. 13:205-225, pls. 15-17
STENZEL, H. B.
1971. In Treatise on Invert. Paleo., R. C. Moore, Ed. Mollusca 6, Bivalvia. pt. N, 3:953-1224
SUNSET MAGAZINE
1985. (Nov.). Los Angeles, Calif., pp. 50-54
SWAINSON, W.
1840. A treatise on malacology; or the natural classification of shells and shell-fish. London. 419 pp., 130 text figs.
TAYLOR, A. S.
1869. In J. Ross Brown, Resources of the Pacific Slope with a sketch of the settlement and exploration of Lower California. H. H. Bancroft & Co., San Francisco, Calif. 200 pp.
THOMSON, D.
1985. Tide calendar for the northern Gulf of California. Dept. of Ecology and Evolutionary Biology, Univ. of Ariz.
TRYON, G. W.
1872. Descriptions of new species of marine bivalve Mollusca. Proc. Acad. Nat. Sci. Phil. 24:130, pl. 6
TURNER, R. D.
1954-55. The family Pholadidae in the western Atlantic and the eastern Pacific, pt. I, Pholadinae; pt. II, Martesiinae, Jouannetiinae and Xylophaginae. Johnsonia 3(33-34):1-160
1956. The eastern Pacific marine mollusks described by C. B. Adams. Occ. Papers on Mollusks. Mus. Comp.
VALENCIENNES, A.
[1821]-1833. Coquilles marines bivalves de l'Amerique ... le voyage de MM. de Humboldt et Bonpland. In F. H. A. von Humboldt and A. J. A. Bonpland, Voyage aux regions equinoxiales du Nouveau Continont. Paris. pt. 2. Recueil d'observations de zoologie et d'anatomie comparee. vol. 2, pp. 217-224, pls. 48-50 (1827). II. 262-339, pl. 57 (1832)
1846. In du Petit-Thouars. Voyage Autour du Monde sur la frigate La Venus ... Atlas de Zoologie. Moll., 24 pls. (no text)

VERRILL, A. E.
1870. Descriptions of shells from the Gulf of California. Amer. Jour. Sci., ser. 2, 49(146):217-227
WALKER, B.
1928. The date of publication of Unio Dombeyana Val. Nautilus 41(3):131
WALLER, T. R.
1983. Dahllite in the periostracum of *Lithophaga nigra* (Mollusca: Bivalvia) and its taxonomic and functional implications. A. M. U. Bull. 1:101
WILLETT, G.
1944. Two new west American pelecypods. Bull. S. Calif. Acad. Sci. 43(1):19-22, pl. 8
WILLIAMSON, M. B.
1893. An annotated list of the shells of San Pedro Bay and vicinity. Proc. U.S. Nat. Mus. 15:179-219, pls. 19-22
WILSON, B.
1979. A revision of Queensland lithophagine mussels (Bivalvia, Mytilidae, Lithophaginae). Rec. Aust. Mus. 32(13):435-489, figs. 1-18
WOOD, W.
1815. General conchology or a description of shells. London. 246 pp. 60 pls.

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